

10 Driving Tips That Can Save Your Life

# POPULAR MECHANICS

APRIL 1971  
50 CENTS

Build PM's  
Gay '90s  
Yard Swing  
Page 140

## 9 Great Vacation Houses

An Underwater Habitat  
Your Diving Club  
Can Build Page 104

Performance vs. Durability:  
Can You Have Both in a  
4-Cylinder Engine?



*Coming: First Jet Amphibian!*

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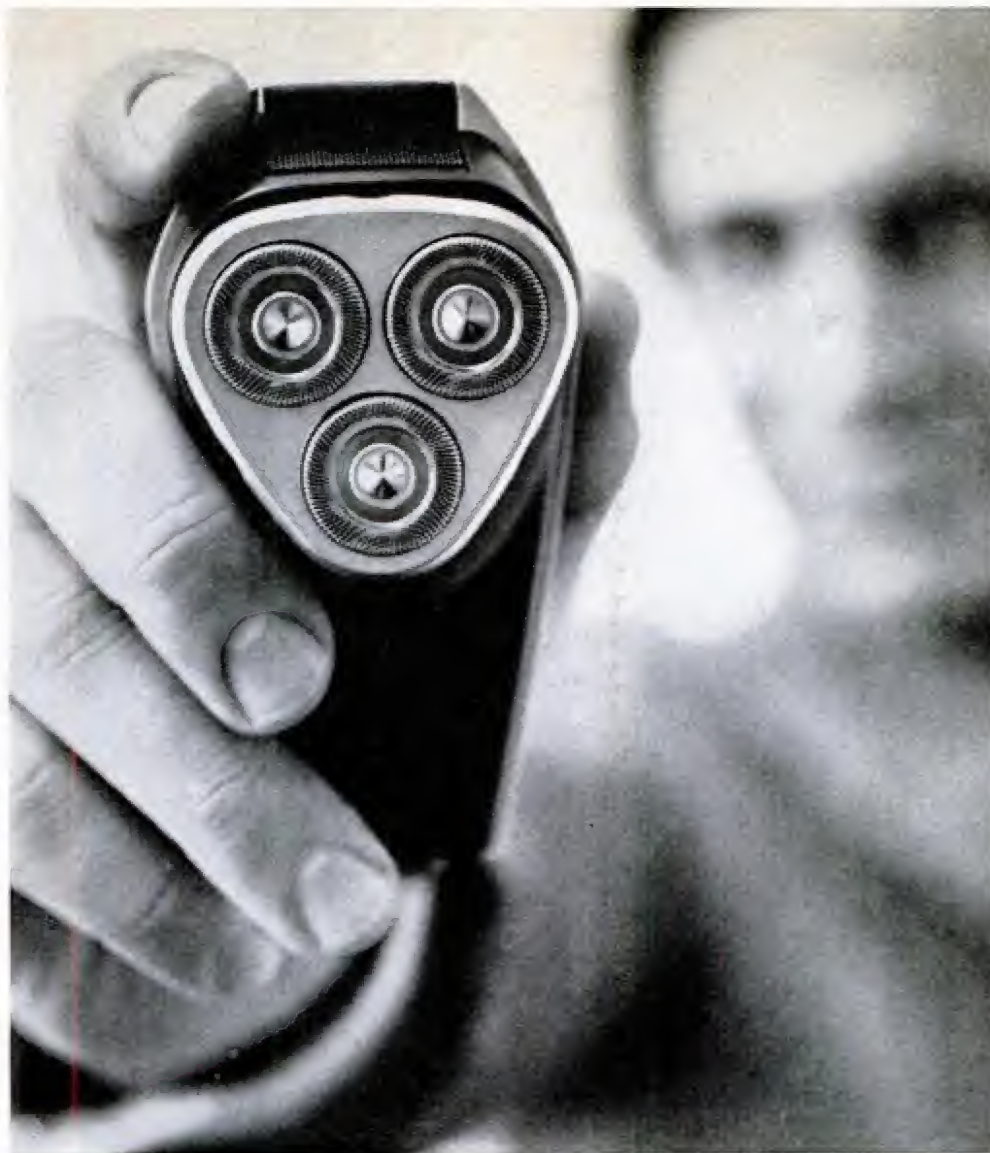
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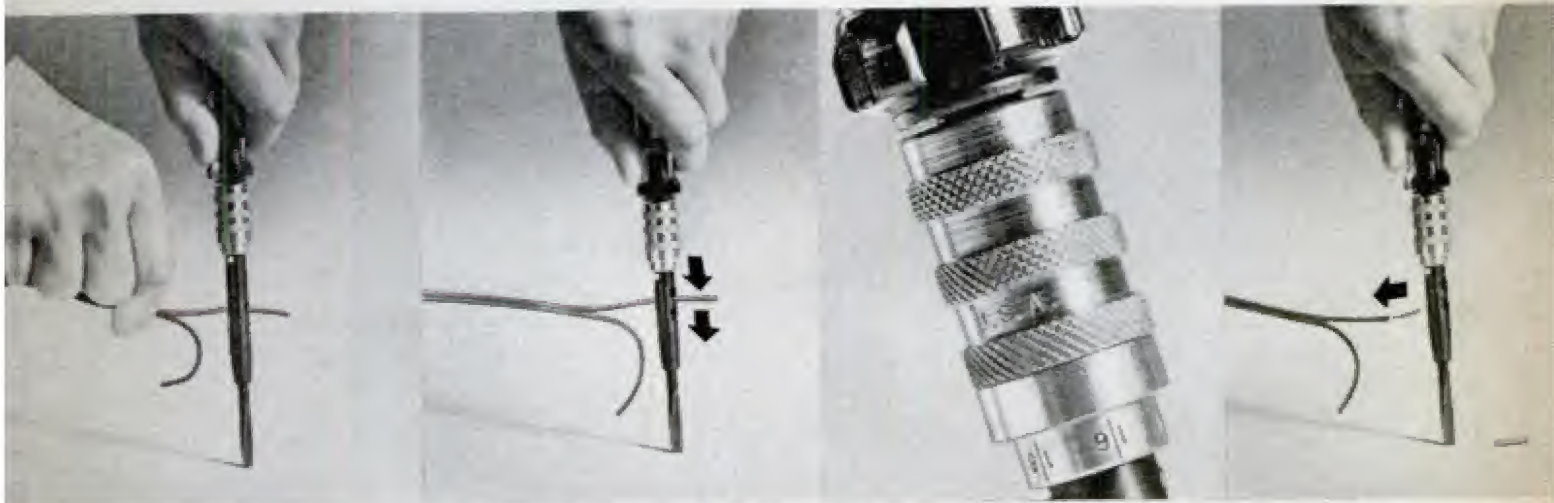
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## AUTOMOBILES AND DRIVING

- 24 Detroit Listening Post
- 38 Drivin' With Dan
- 54 Automobile Clinic
- 69 Ten Driving Tips That Could Save Your Life
- 82 PM Owners Report: Lincoln-Mercury Capri
- 94 Those 'Little' 4-Cylinder Engines—Can You Have Durability, Performance?
- 116 Saturday Mechanic: How to Clean Up Dirty Mechanical Problems
- 129 New for Your Car

## SHOP AND CRAFTS

- 153 Tic-Tac-Toe You Can Play Anywhere
- 157 Hints From Readers
- 162 Contemporary Pedestal Table
- 165 Grinding-Wheel Dresser Assures Square Bite
- 168 A Little Tool With a Big Bite: the Jeweler's Saw
- 171 New Tools You Should Know About
- 172 Hints From Readers

## BOATING, OUTDOOR RECREATION

- 50 What's New Outdoors
- 66 On-the-Go Camping
- 100 How to Outfit for a Wilderness Canoe Trip
- 120 Fishing Tips
- 122 How to Cartop a Boat Without Suffering a Hernia

## SPACE, AVIATION, MILITARY

- 77 Coming . . . The Incredible Skyshark—First Amphibious Jet
- 90 Now: Big, Quiet Buses for Airlines

## ELECTRONICS, RADIO AND TV

- 124 Electronic Hints
- 126 Good Stereo at a Glance

## HOMES FOR VACATION LIVING

- (Second Homes That Can Become First)*
- 144 Contemporary Trilevel
- 144 Octagonal House
- 146 A Cottage for Sea or Ski
- 147 Americanized Swiss Chalet
- 148 Informal Living for Sun and Surf Fun
- 149 Good Living in a Low-Cost Hideaway
- 150 Weekend Retreat for Shore or Country
- 151 Now It's 'Instant' Leisure Living
- 152 Simple Lines Blend With the Land

## HOME AND YARD

- 112 More Muscle for Little Tractors
- 134 How to Service Small Engines—Part 2: Repairs
- 140 Build This Old-Time Yard Swing
- 154 Build This Cabana Now
- 158 Solving Home Problems
- 160 Your Garage Can Be a Screened Summer Room
- 166 Exciting New Products
- 196 Homeowners' Clinic

## SCIENCE AND INVENTIONS

- 20 Science Worldwide
- 88 Mini-Ships Bring the Ocean to Mid-America
- 98 Just Patented: PM's Pick of the New Inventions
- 104 Sublimnos: Underwater Habitat
- 108 They Bring 'em Back to Life!

## PHOTOGRAPHY

- 130 Shoot Portraits With a Single Light
- 132 Photo Hints

## ENVIRONMENT

- 192 Pollution Fighters' Newsletter

## REGULAR FEATURES

- 6 Letters

Cover Illustration by Roy Grinnell

Coming . . . *the Incredible Skyshark—First Jet Amphibian*

## NEXT MONTH IN POPULAR MECHANICS

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& Stream...



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## LETTERS TO THE EDITOR

### A bit too fast

In reading *Saturday Mechanic: How to Service Sparkplugs* (page 146, Jan. PM), I found in the first paragraph the statement: "The electrode end of a sparkplug in an eight-cylinder engine fires 200 times per second..." As the engine makes two revolutions for each time a plug fires, then it must have been turning 200 times 2, or 400 revolutions per second—or 24,000 revolutions per minute. Does this not seem to be a bit high?

I want you to know I look forward to every issue. I must have been reading PM off and on for at least 50 years.  
ROCK HILL, S.C. JOHN C. PORTER

Author Mort Schultz (who really doesn't have to suffer this way very often) admits that his face is red. "An eight-cylinder engine running along at a moderate rate of speed—about 2500 rpm—would cause each sparkplug to fire 20 times per second—not 200," he says. "Guess I was 0 happy."

### Runaway oil spill

In putting the Lid on Oil Spills (page 82, Jan. PM), the author states on page 84 that escaping oil from Chevron's Platform "C" created a "slick 52 miles square." This is a gross mistake and should read "52 square miles." A slick as described by the author would cover over 2700 square miles!

TORONTO, ONT.

VICTOR KRISEL

And would be 52 times messier.

### Felony at Hatteras?

There is a real goof in *Surf Fishing With a 4-Wheel Drive* (page 106, Feb. PM). The badly retouched photograph on page 106 is the same one that the State of North Carolina used in its publication, *Hunting and Fishing*. To compound this felony, the author has the utter gall to call this Cape Cod. It is not Cape Cod but Hatteras. We spend our vacations on the Outer Banks every year and, of course, Hatteras is a must.

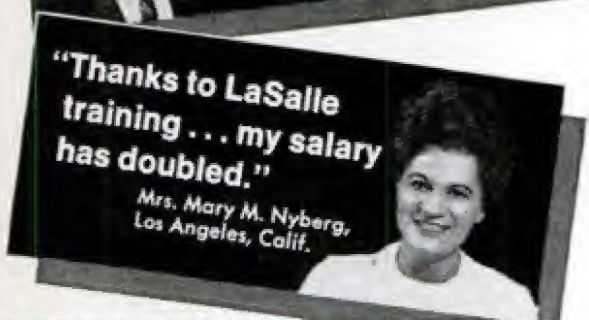
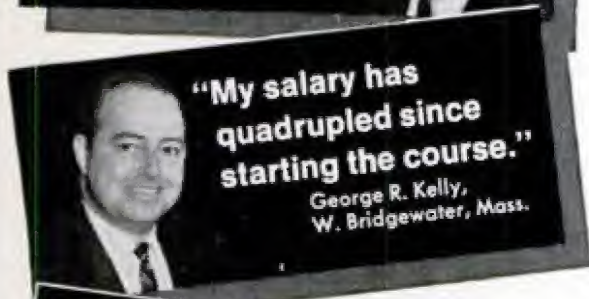
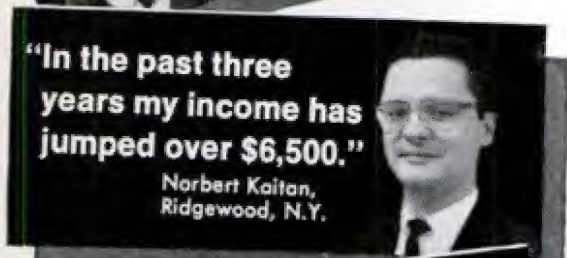
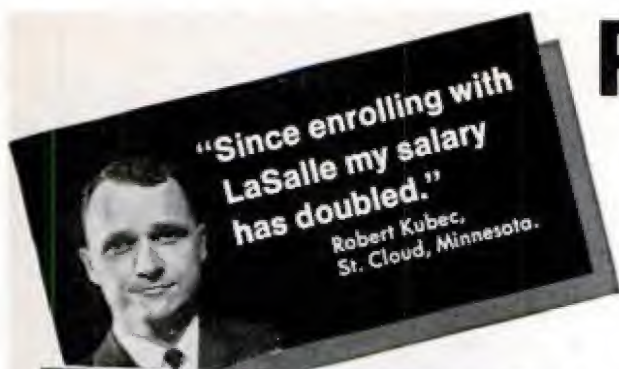
I would be interested in your findings on this matter.  
CINCINNATI NELSON N. NORRIS

Our findings: There is indeed a picture on page 106 (badly retouched? Our art director says it's the printing) that unmis-

(Please turn to page 8)



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## LETTERS

(Continued from page 6)

*takably shows the lighthouse at Cape Hatteras. But nowhere did we find anything that says it's Cape Cod. Matter of fact, the photos for the article came from all along the Atlantic Coast. No felony, compound or otherwise, we say.*

### That's what the owners say

The *Mercedes-Benz Owners Report* (page 100, Jan. *PM*), while giving favorable mention to Mercedes-Benz, has some sly, poisonous references to the 220D diesel model.

The dealer from whom I've purchased four diesel cars in the past 12 years (I've driven over 150,000 miles in them) offers a lifetime lubrication policy for \$15. I have spent less than \$30 over the entire 12 years for engine adjustments. Never have I enjoyed such freedom from trouble and such dependability in any automobile—and in 50 years I've had a lot of them.

I suggest that the author, Michael Lamm, write another article after he has driven a M-B220D at least 3000 miles. Possibly he might become motivated to inspire American car builders to make a real contribution to the reduction of air pollution and cut fuel consumption in our nation by almost half. A diesel engine emits only about two percent of the carbon monoxide that is discharged by a gasoline-burning car.

PORTLAND, ORE.

WALTER J. WIDMER

*The comments in the Owners Report are not Mr. Lamm's, but are direct quotations or summaries of quotations from Mercedes-Benz owners. Actually, they were predominantly favorable.*

### Calling Vietnam

We found your article *How to Talk to Vietnam—Free* (page 108, Sept. *PM*) most interesting. We have cooperated with the MARS organization throughout the world—especially in Southeast Asia—in assisting American servicemen to have contact with home. Thousands of "phone patch messages" are handled each month.

Your article has several important errors. Some of the information appears to be more than two years old. In 1965 we started working with the Post & Telecommunications of Vietnam to meet the increased demand upon the existing telephone system. In April 1968 we helped them install equipment designed and built by the Bell System, which provided eight

(Please turn to page 10)



## The best in San Francisco.

Ernest Craig can do things with color dyes that would make a lady faint.

"The best dye man in San Francisco taught me. He passed on, and now I'm the best.

"I dig this neighbor-

hood. We get a lot of fog from the sea, but the people are right on.

"My Buick is something special. You know, I like to get my money back on a car so I treat it right.

"I switched it to

Champions right after I got it. I don't see the point of having less than the best."



Toledo, Ohio 43601

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Check for facts on GI Bill  
Accredited Member National Home Study Council

## LETTERS

(Continued from page 8)

commercial telephone lines to the United States. This equipment was expanded, and by January 1970 there were 14 lines from the United States serving nearly 30 locations throughout Vietnam.

Station-to-station rates have been in effect since Dec. 1, 1968; GIs can call for \$9 for the first three minutes; overtime is at the rate of \$3 per minute.

We agree that it is very difficult to locate servicemen in Vietnam. The most effective way is for the serviceman to go to one of the 30 locations and place the call.  
AT&T LONG LINES T. MICHAEL FORNEY  
SAN FRANCISCO INFORMATION SUPERVISOR

### Found: another debugger

In *Wanted: Electronic Detectives* (page 110, Jan. PM) your author states that even in the highly industrial Northeast, he found only three companies that said they had a debugging service.

My agency, Delaware Valley Detective Agency, Newtown Square, Pa., not only specializes in this field of debugging, but we also have spent many years and many dollars in the development of more modern, sophisticated, modified detection equipment. Our clients are privileged information. Our service has never been questioned.

NEWTOWN SQUARE, PA. LEWIS SMITH JR.

### Not toothpaste tubes

It is correct that the addition of tin to lead will lower the melting point of lead (*Solving Home Problems*, page 162, Jan. PM). However, some other source than toothpaste tubes must be found; the majority of tubes are made from aluminum and the remaining ones from lead.

Since the commercial price of tin is around \$1.60 a pound, compared to 15 cents a pound for lead, I will settle for an all-lead sinker even though it means a bit higher gas bill.

WALNUT CREEK, CALIF. JOHN N. CASPAR

### Happy with blueprinter

In 1966 I retired and then went into business for myself as a land surveyor. I work out of my home, and since the nearest blueprint company was four miles away, I constructed PMs' dry copier (\$3 *Dry Blueprinter*, page 146, Jan. '65 PM). I paid \$40 for a bracket with two 18-inch, 20-watt black lights. Ninety-five percent of my drawings of surveys are legal size or smaller. I make my drawings with India

(Please turn to page 12)



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The Mileage Specialist

## LETTERS

*(Continued from page 10)*

ink on a very transparent, durable tracing paper. With a printing exposure time of 2½ minutes, my copies are as good as any commercial company's.

In the four years I have used the printer, I have saved \$600—by a very conservative estimate.

SEATTLE

RAYMOND H. EIDE

*Anyone else who wants to make the blueprinter can purchase Xerox copies of the article for 75 cents from Popular Mechanics, Dept. JL, 224 West 57th St., New York, N.Y. 10019.*

### Lathe builders

Enclosed is a photograph of three faceplate lathes built by students in my ninth-grade industrial arts class from plans in *Make This Faceplate Lathe From Odds and Ends* (page 194, Nov. '70 PM). The interest generated, and the joy of each student, to produce a useful machine tool is evidenced by their enthusiasm for the



project. It is a meaningful experience involving woods, metals and electricity. The only change we made in the plans was the addition of a switch to control the motor.

For several years I have used your magazine in my classes as a source of project ideas and reference for articles which are up-to-date in the many fields of industry. Thank you for many years of interesting projects.

KEMPSVILLE JUNIOR  
HIGH SCHOOL  
VIRGINIA BEACH, VA.

JOHN E. STAHL,  
DEPT. CHAIRMAN,  
INDUSTRIAL ARTS

### Underwater Stars

I saw a picture in another magazine's "What's New" department of a small research submarine called *Star II*. The magazine said it was a "new star of the underwater world." Didn't you have an article

several years ago about *Star III*? Judging from its name, it must be newer than *Star II*. Am I right?

SAN DIEGO

HENRY JOHNSON

*You are indeed. Dan Fales, then PM's outdoor editor and now managing editor of Motor Boating and Sailing, went to the bottom of Long Island Sound in General Dynamics' Star III 'way back in 1966, and he described his experience in our May 1967 issue. Star III is more than four years old. Star II, still in service, is an earlier model.*

### Dancing lights

I enjoyed making your dancing light (*Build Your Own Dancing Light Display*, page 144, Dec. PM). I made two for stereo



light and sound and connected the speakers to the speaker terminals on my stereo.

ALPENA, S.D.

BRADLEY JOHNSON

I think the light display is the best project you've come up with for the teenager. Keep those great projects coming!

MARMADUKE, ARK.

DON WATSON

It looks great! It is everything the article said it would be. But there is one problem. When I plug it into the same wall socket as my FM receiver and the lights start to blink, it causes static in my speakers. This is also the problem when I use my turntable. I have tried other outlets, but the same thing happens.

WINDSOR LOCKS, CONN. PHILIP FAMIGLIETTI

*Unfortunately, we've found the blinking bulbs do sometimes cause interference when music is playing. A Cornell-Dubilier plug-in filter will help reduce this interference, although it may not be possible to eliminate it completely. The filter is available from Allied Radio Shack, 100 N. Western Ave., Chicago, Ill. 60680, for \$1.44. It's part No. 755-2100. ★★*



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# Is your camper-pickup suspension better around the campfire than it is on the road?

Some people disagree on the “best” kind of camper-pickup suspension—coil springs, coil and leaf springs, or leaf springs.

It makes for some lively conversation at night, around the campfire.

But almost all of them agree on the reason why they chose theirs—a luxurious, soft ride. It’s nice that they can agree on one point. But it’s also very wrong.

## **A rule of thumb that comes from the seat of your pants.**

It’s only natural that a camper would buy in a pickup what he’s always looked for in a car—a road-smoothing ride.

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Because he’s never driven a car that weighed upwards of three and one-half tons, with seven feet between the roof and the road. Or a car that put 3000 pounds of tire-squashing force on its front axle when a deer crossed his path.

A pickup is a truck. A car is a car. They’re made to do different jobs...and that includes their suspensions.

To carry heavy loads safely, a truck has to have maximum stability. It has to have a suspension built to truck standards. There’s another rule of thumb to determine that.

## **Choosing the right camper-pickup suspension is as easy as 4, 6, 8.**

A coil spring gives you one point of suspension per wheel. ↓



A leaf spring gives you two.

An all-coil spring suspension, therefore, gives you a total of 4 points of suspension.

With coils up in front and leaves in the rear, you’ll have a total of 6 points of suspension.



An INTERNATIONAL 1210 Camper Special pickup has leaf springs all around. So you get a total of 8 points of suspension.

This all becomes a matter of simple mathematics: When you’re buying a pickup to carry your family and an insert, how many points of suspension should you have under you?

4, 6 or 8?

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*A newspaper that blind people can hear has been developed by German and Swiss researchers. Though it looks much like ordinary paper, it is impregnated with minute iron needles that can be magnetically arranged in patterns (the same way tape is imprinted in a tape recorder). The "reader" uses a pencil-like sensor, which he moves across the paper, using grooves as guides. The sensor is connected to a small earphone. Though adequate, the sound reproduction is not of tape-recorder quality. The paper can also carry visible print for sighted readers.*

*Jupiter may be radiating 2.5 times as much energy as it receives from the sun, according to Dr. Robert Wildey, an astrophysicist with the U.S. Geological Survey. He says recent studies indicate that Jupiter's temperature is higher than it would be if the sun were its only source of energy. The big planet radiates heat in the form of infrared light, not visible light. "It may be that Jupiter has not quite finished 'falling together' into a rigid planet from the original interstellar debris from which it was formed, so that its power generation is essentially gravitational energy conversion," he explains. "Thus, we might have to consider Jupiter—rather than Alpha Centauri—the nearest star beyond our sun."*

*The painful flu shot may in the future give way to a painless flu sniff, according to an epidemiologist at the National Center for Disease Control, Atlanta. He reports that a live virus vaccine, now being worked on at the University of Michigan, Baylor University and the National Institutes of Health, has proved effective in a limited test. The vaccine is administered by atomizer and is breathed in through the nose. Researchers think that the vaccine may be ready for widespread use within a couple of years.*

*Priceless Egyptian artifacts—overlooked by grave robbers—were recently discovered by a team of University of Michigan researchers who X-rayed 29 mummified pharaohs and their queens. About one-fifth of the mummies wore gold arm bands, sacred amulets or other jewelry, placed on the bodies by Egyptian high priests at least 3000 years ago. The "loot" was missed by thieves because it was covered by linen garments or a black resin used as a preservative. The research was carried out in the Cairo Museum, where the mummies have been stored for decades.*

*Lip prints are as individual as fingerprints and may offer a new means of personal identification. So say Tokyo Dental College scientists who studied lip prints taken from 150 males and 130 females ranging in age from 6 to 57. In all the prints there were individual differences in lip grooves and wrinkles. A long-term study will be conducted to determine if the patterns remain unchanged for life.*

*This year could be a big one for earthquakes, according to Charles A. Whitten of the Commerce Dept.'s National Ocean Survey. He says there is a possible link between the Earth's wobble as it rotates and the incidence of earthquakes. The wobble is a cyclical phenomenon that will reach a peak this year. The source of the wobble is a mystery. Whitten says the sloshing of the Earth's molten core against an otherwise rigid structure might be a contributing factor. He notes that other geophysicists speculate that it's due to the melting of the polar icecaps, the movement of the seas or the unevenness of the Earth's land masses. Whitten points out that major quakes in 1950, 1957 and 1964 (when the great Alaskan earthquake occurred) coincided with years of maximum rotational wobble.*

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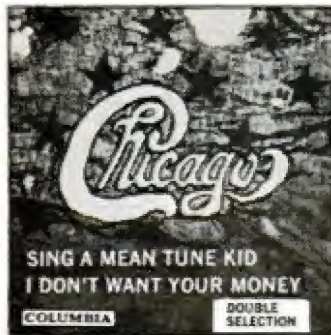
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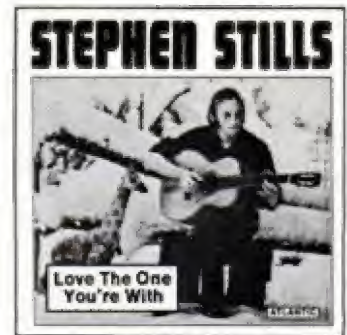
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198986



199158

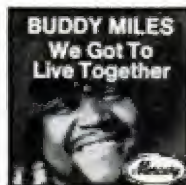


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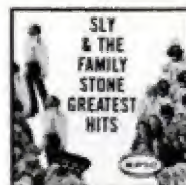
# Any 3 tapes or



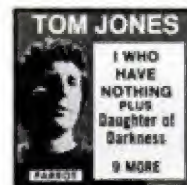
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198200



196246



196972



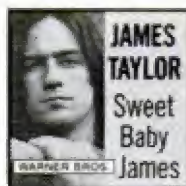
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197913



193623



188367



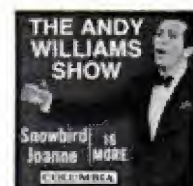
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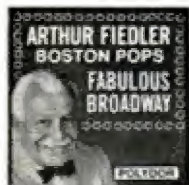
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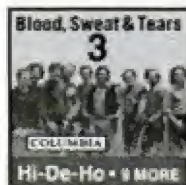
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196493



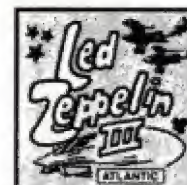
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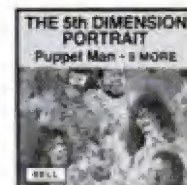
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195487



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191205



193177



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186809



191189



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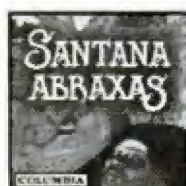
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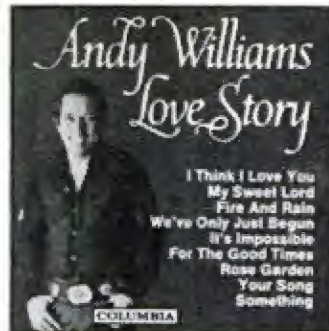
195685

CO-41/S71 \* Selections marked with a star are not available in reel tapes

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196725



201145

# records

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only **\$1.00**  
plus mailing  
and handling

If you join now and agree to buy as few as  
four selections during the coming year

Just look at this great selection of recorded entertainment — available in your choice of 8-Track Cartridges OR Tape Cassettes OR Reel-to-Reel Tapes OR 12" LP Records! So no matter which type of stereo playback equipment you now have — you can take advantage of this introductory offer.

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As a member you will receive, every four weeks, an informative music magazine — describing the regular selection for the month, and scores upon scores of alternate selections from every field of music.

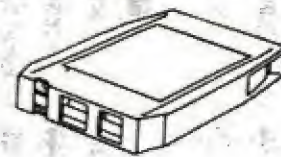
If you do *not* want any selection in any month — merely return the special card by the date specified. If you want *only* the regular selection, do nothing — it will be shipped to you automatically. Or use the card to order any of the alternate selections offered. And from time to time, we will offer some special selections, which you may reject by returning the special dated form provided — or accept by doing nothing.

Your own charge account will be opened upon enrollment . . . you pay for your selections only *after* you have received them. They will be mailed and billed to you at our regular prices: cartridges and cassettes, \$6.98; reel-to-reel tapes, \$7.98; records, \$4.98 . . . plus a mailing and handling charge. (Occasional special selections may be somewhat higher.)

**Fantastic bonus plan.** Your only obligation is to buy four selections during the coming year. After doing so, you have no further obligation — and you may cancel membership at any time. If you decide to continue, you will be eligible for our generous bonus plan — which can save you at least 33% on all your future purchases! Act now!



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8-track  
cartridges

OR



tape  
cassettes

OR



7" reel-to-  
reel tapes

OR



12" LP  
records

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Terre Haute, Indiana 47808

Please accept my membership. I am interested in this type of recorded entertainment: (check one only)

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Send me these three selections, for which I will be billed only \$1.00, plus mailing and handling: (write in numbers of the three selections you want)

--	--	--

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- Easy Listening     Today's Sounds     Country

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 Miss..... First Name    Initial    Last Name  
 (Please Print)

Address.....

City.....

State..... Zip Code.....

APO, FPO addressees: write for special offer  
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DETROIT

# LISTENING POST

BY ROBERT LUND

**GM'S LOOKING AT EVERY TRANSMISSION IT HAS** in the house, including experimental hardware never used in production cars, to determine the best unit to team with a Wankel engine. The company has been working on a highly advanced Chaparral-type transmission for at least five years, but that job would be too expensive to pair with a Wankel.

**IF CADILLAC BUILDS A SMALL LUXURY CAR**, will Lincoln and Imperial go the same route? Chrysler says "No" very emphatically. Ford's reaction is the same, but with a qualifier. Ford's not eager to get involved in any try-it-on-for-size that could diminish Lincoln's standing as the crème de la crème machine, Dearborn style. But if Cadillac brings out a junior edition, smaller but still a high-priced prestige car, and continues to hold the loyalty of its customers, Lincoln might reconsider.

**FORD HASN'T DECIDED TO BUILD A CAR SMALLER THAN PINTO**, BUT company planners have been talking a tentative launch date for an American Beetle, if and when the project's approved. The target is fall of 1975—as a '76 model. Ford still isn't sold on the idea that there's much of a market for a one-seat, two-person car, but the company's working out the preliminaries so it will be ready if the green light goes on.

**WHILE BASIC VEGA AND PINTO DESIGNS WON'T CHANGE** for a few years, according to assurances from Chevrolet and Ford, both companies are considering what could be done to make the minis cheaper or more expensive—how far they could be stripped down or rolled up, if economic conditions warrant price cuts or price increases. A boom in car sales, more expensive makes in particular, would be the signal for more expensive derivatives of Vega and Pinto, although the basic shapes would stay the same. On the other side of the coin, if sales lag, the cars will be dieted down.

**CARS WILL DEFINITELY COME DOWN IN SIZE AND WEIGHT** over the next three or four model years. Does less weight mean lower prices? The carmakers are always quick to deny that cars are sold by the pound, but the fact is the more a car weighs, the higher its price. The companies admit future cars will be smaller and weigh less, but they're not optimistic about reducing prices. Prices may level off, instead of going up, as a result of the trend, but they're not coming down.

**FORD'S WORKING ON A ROLLTOP REAR** for its wagons to counter the Glide-Away tailgate developed by GM, but the Ford version may not be ready until after the '72 cars come out. Ford's trying to improve on the idea—make it safer and easier to service than the GM original—so it will be awhile before Ford gets the gear into production.

**IF YOU LIKE THAT PONTIAC PROW** on Thunderbird, you'll have to order within the next few months. The car will be completely reworked, nose job and all, this fall. Going by the calendar, T-bird wasn't due for a major change until the '73 model. The car's been on a three-year styling cycle and this is only the second year for the current model. But the Pontiac snout is a reminder of an unhappy experience at Ford. "Bunkie" Knudsen, deposed president of Ford, ordered the controversial nose put on the car when he came to the company from GM, and Ford's erasing the last reminders of Knudsen's brief tenure as top man.

**SWITCH SERVICE PITCH?** The auto companies long have tried to convince car owners the only place to have an automobile serviced is at a franchised dealer's. You know the

*(Please turn to page 26)*



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**We hoisted a 200-lb. mechanic on a dozen skinny cords used in Atlas tires as a test of strength.**



**So you'll feel more secure driving on the strength of thousands of cords in any tire in the Atlas line.**

At Atlas we believe that strength gets you mileage.

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## DETROIT LISTENING POST

*(Continued from page 24)*

pitch. Factory-trained mechanics. Factory-approved tools. Genuine parts. Take your car to an authorized dealer. The line about going to an authorized dealer was supposed to be a subtle way of saying that if you went elsewhere, the work wasn't authorized. Unauthorized, meaning inferior, without saying so flat-out.

That argument had some validity years ago. If you went to a nondealer shop, you ran the risk of having junk parts put in your car or second-hand stuff salvaged off wrecks without being reconditioned. But there aren't any gyp parts these days. There are different grades—first, second and third-line parts—depending on what you want to spend. But the quality is there, even in the least expensive lines. That's no guarantee against getting gyped. There are still some gyp repair shops and gas stations, just as there are a few gyp automobile dealers. But you're not likely to get cheated on the parts.

One of the mathematical facts of life Detroit doesn't like to acknowledge is that there aren't enough authorized dealers to service all the cars on the road. Dealers handle about 30 percent of the business and the other 70 percent is spread among gas stations, do-it-yourselfers, garages, specialty shops and the big chains: Sears, Penney's, K-mart, et al.

One auto company has decided to try a new approach to increase the availability of service for its cars. The plan is to sign up nondealer shops—the once despised unauthorized repair shop—to service franchises. They won't sell cars, just fix 'em. Guess which company? No, not one of the giants, but the minnow of Motown, American Motors. AMC doesn't want to make too much noise about the venture, because it's sure to rile up dealers who think they should have a lock on the business, even though they lack the space and mechanics to do the job. AMC is experimenting with the idea in Canada, where it has signed 110 shops to service franchises. If the experiment works in the Land of the Maple Leaf, it will be imported into the United States.

**MORE CATEGORIES OF CARS**, from mini machines up to whale-size prestige vehicles, are foreseen by the wheels about town, yet carmakers would like to reduce the number of models. Obviously, the market is splintering into more subsections. But how do you build more car types and cut down on variety at the same time? How do you compress the works for a grandfather clock into a wristwatch? ★★



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the only pick-up built from the ground up with 4-wheel drive.**

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Comes with all those options you want or need. Even air-conditioning.

When you want to get away from it all, you need the Jeep Gladiator.

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4-letter word on wheels.**

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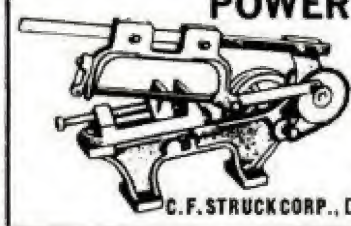


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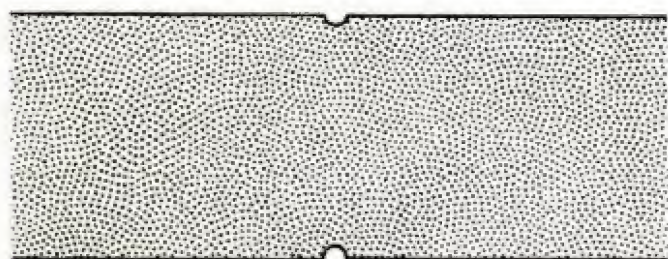
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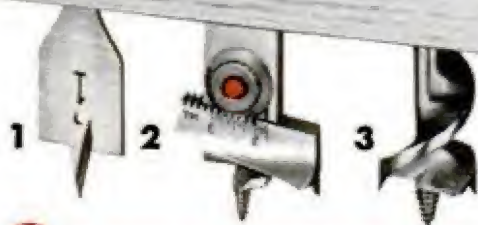
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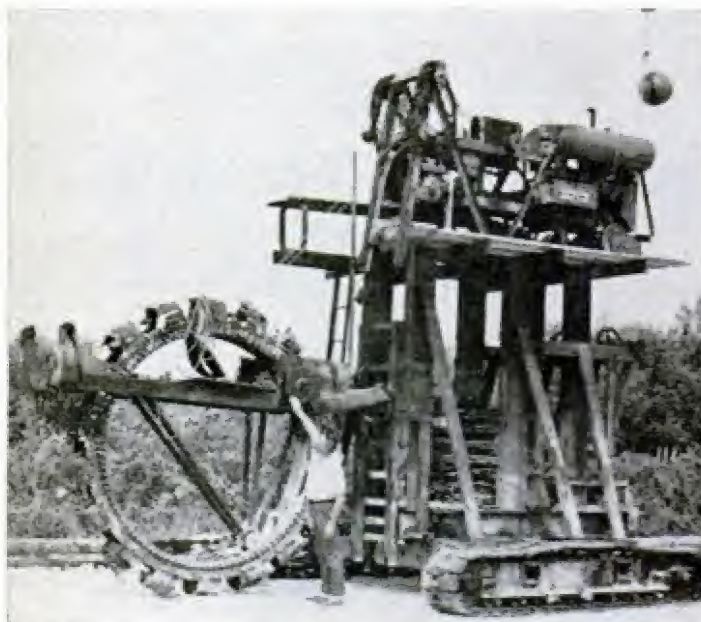
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## NEWS BRIEFS



### Trencher on stilts for deep cuts

Faced with the task of digging a seven-foot-deep trench across ocean inlets in which the water was up to 15 feet deep, the Southern Electric Assn. of Tampa, Fla., came up with this rig. It's a standard trencher elevated on I-beams and mounted on the tracks of an abandoned backhoe.



### Towering teddy

"Largest ever made," claims the London manufacturer of this nine-foot-tall teddy bear. Price: about \$275.



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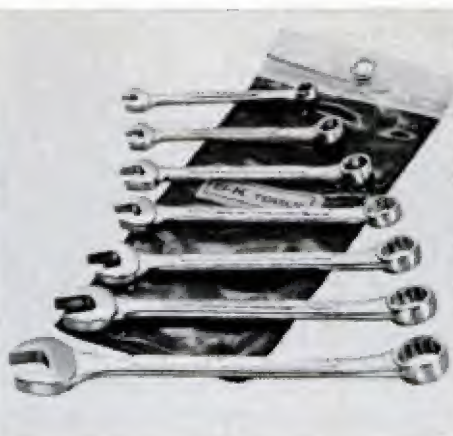


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## Noisy earrings

The revolver decorating this lovely Londoner's earrings actually fires—six times, if she wants to be persistent. It's all noise, though; the cartridges are blanks.



## Portable kidney

Dr. John Stewart, Sydney, Australia, physician, displays a new artificial kidney that patients can carry home in an overnight bag. Standard kidney machine is in the foreground.

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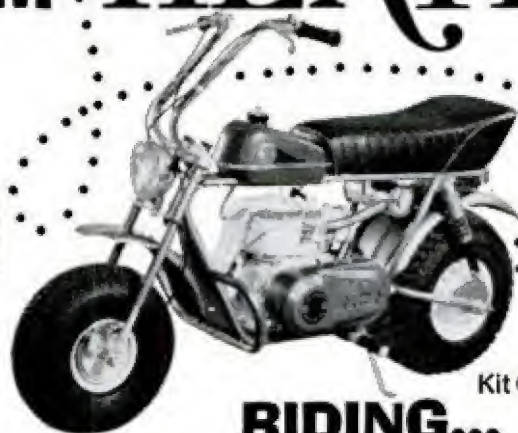


Kit TO-101

## PLAYING...

the new Heathkit "Legato" 25-Pedal Organ makes a fascinating spring interlude. Includes 19 different organ voices, 2 solid-state amplifiers, 2-speed Leslie speaker plus main speaker and the exclusive Thomas Color-Glo method that lets you play complete, professional-sounding songs in minutes.

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# Drivin' with Dan

How does 'ram-air' help a street car? What happened to Chrysler's 50 experimental turbine cars? How would you alter a '66 Mustang for wide ovals? Dan Gurney answers these and other automotive questions

**Q.** *I was shocked to see that you retired from your fantastic racing career to go into other aspects of racing. What plans, if any, do you have in addition to those you discussed in your story last month? (Whatever they are, good luck.)—Peter Klaput, Marina, Calif.*

**A.** Thanks for the kind wish. I plan to continue as president of All American Racers. Our major effort in '71 consists of a two-driver racing team (Bobby Unser and Swede Savage) entering in all the USAC championship oval races for Indy Cars. We are also continuing our engine development work for race cars, as well as exploring the motorcycle world.

**Q.** *Does "ram-air" on a street car cool the motor,*

*or what?—Steven Capusten, Prince Albert, Sask., Canada.*

**A.** The idea is to feed cooler air to the inlet. At high speed, if the ram air ducting is good, it also gives a little ram pressure effect (a tiny amount of supercharging). Cool air is more dense and contains more oxygen. With everything else being equal, you should be able to burn more fuel and get more horsepower.

**Q.** *What happened to Chrysler's 50 experimental turbine cars made in 1964 and lent to typical U.S. families for testing? It was rumored Chrysler would add a production model by 1970. Well?—Burdette Bolenbaugh, Ohio City, Ohio.*

**A.** I surmise that it didn't work well enough to carry on with it. The piston engine does a very good all-around job and the industry is very familiar with it, and, of course, has a huge financial investment in it. Putting a turbine engine into production, even if it were "perfected" and cost not much more than the piston engine, would mean a considerable and abrupt write-off of the piston engine and certainly be alarming to stockholders.

**Q.** *I have read where people are successfully cooking food, such as roast beef, by wrapping it in aluminum foil and attaching it to their car manifold. Apparently the food is pretty well cooked after a few hours of driving. Is this a good idea as far as good operation of the car is concerned?—Mrs. R. E. Reeves, Oakland, Calif.*

**A.** It doesn't seem as convenient as an oven! How many miles for well done in second gear, and what mph is best for beef stroganoff? I should think the recipes would be very complicated for an eight-cylinder, 6.5-liter pot roast. It won't hurt the car and the

*(Please turn to page 40)*



**CAMERAMEN** from NHRA and Dan Gurney Film Associates focus on a "rail" as it starts its quarter-mile run at Ontario Motor Speedway during last year's Supernationals. The "Christmas tree" starting lights are set up to use only one yellow for the countdown in the pro events instead of the usual five to minimize anticipation and fouling. Yellow, green, BANG!

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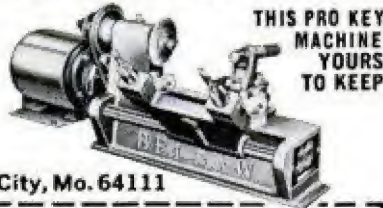
"Made \$300 a month in spare time."—H. Rivas, Los Angeles, Calif.  
 "Cleared \$110 last Saturday."  
 —R. M. Davis, St. Louis, Mo.  
 "I hit \$125 in one week sparetime!"  
 —V. Tizio, Brooklyn, N.Y.

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## DRIVIN' WITH DAN

*(Continued from page 38)*

"pollution" might smell a lot more delicious! This is a good trick for campers who want dinner as soon as they arrive at a site.

**Q.** Why are all your racing cars numbered 48?—Gary Nichols, Antioch, Calif.

**A.** Over the years, it just became my favorite number.

**Q.** Could you tell me what a torque converter is?—Harry van den Honert, Pittsfield, Mass.

**A.** It is a device which changes the amount of torque and speed. If the input shaft is turning 1000 rpm with 500 ft.-lb. of torque, the 2-to-1 converter should change it to 500 rpm with 1000 ft.-lb. of force at the output shaft. Most torque converters as we know them are variable and contain a fluid coupling, but a simple system of pulleys such as in a block and tackle is also a torque converter of sorts.

**Q.** I bought a '66 Mustang and want to put wide ovals on it. I have been told I will either have to cut out the wheel wells or raise the front end to do this. Do you advise either method and do you have any related handling tips?—Richard Clark, Arlington, Va.

**A.** I would not raise the front end, but run it as low as is practical. I also would avoid cutting the fenders. Usually we get a body man to bulge the metal out in the areas where it may touch. Large front and rear antiroll or sway bars help a lot. Get some Ford high-performance shocks, too.

**Q.** What is the updated world land speed record?—Lance Foster, Lexington, Va.

**A.** It's 622.407 mph, set by Gary Gabelick (U.S.A.) with his rocket-powered, natural-gas special called the Blue Flame, running on special Goodyear tires. For motorcycles, it is 265.492 mph by Cal Rayburn of U.S.A. on a Harley-Davidson.

**Q.** I am interested in becoming a car mechanic. Do you know of any auto companies having a training program?—Ken Jacot, Whittemore, Mich.

**A.** I suggest that you contact the auto companies directly. In addition, you might find

*(Please turn to page 42)*

# Von Schrader offers you three ways to a growing income in your own business

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**Von Schrader Carpet Deterger.** Cleans so completely it helps restore natural beauty. Fast drying.



**Von Schrader Upholstery Deterger.** Gives deep-level cleaning to fabric upholstery and synthetics.



**Von Schrader Wall Deterger.** Washes walls and ceilings 6 times faster (and better) than hand method.

bucket-and-sponge method. Cleans easily without any mess.

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## DRIVIN' WITH DAN

*(Continued from page 40)*

it worthwhile to get in touch with a university for more information. Chaffey College in Ontario, Calif., is offering a course in auto racing.

**Q.** *Did you have to make any alterations to your Eagle after Indy to run it at Ontario in the California 500? If so, what were they?—James Spencer, Baltimore.*

**A.** Yes—mostly aerodynamics and cooling changes. The Eagle was handling much better at the Ontario 500 than at Indy because we changed suspension in several areas.

**Q.** *Does a spoiler designed to hold down the front end cause the car to need more power?—Jim Bechtold, Davis, Ill.*

**A.** As a rule, it does not. It works like a cowcatcher and pushes air off to the sides rather than packing it all underneath. The car then runs a little lower, and has less frontal areas and less drag.

**Q.** *Are there any printed forms a fan could use at races to write down the driver's name, starting position, laps completed, etc.? When at the races I have to start drawing lines which are never straight.—Charlotte Melise, Stirling, N.J.*

**A.** Most of the better programs have something of this sort available in them. I don't know of a universal type that will fit all requirements. It looks as though you will be forced to make your own at home before the race if all else fails.

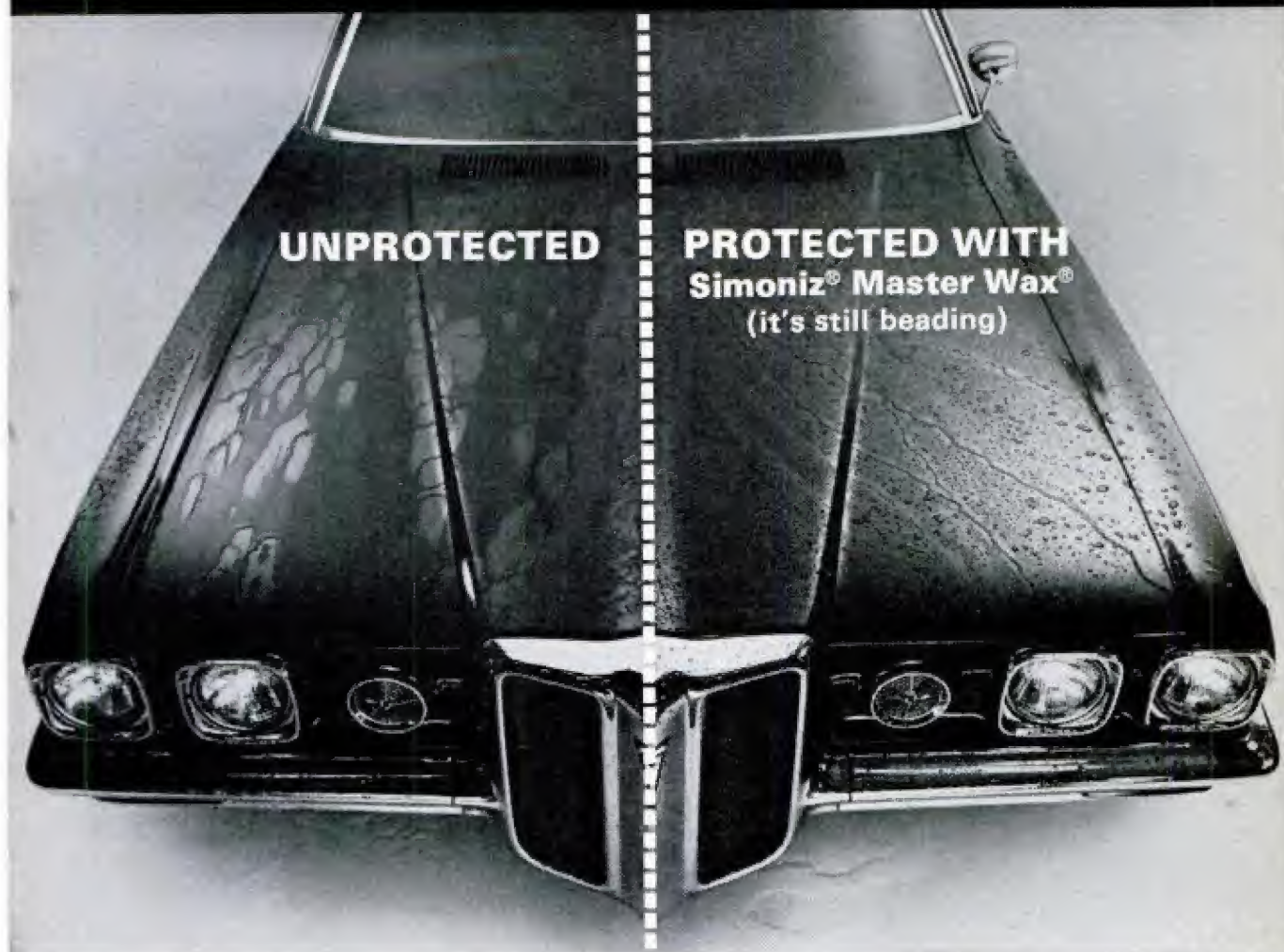
**Q.** *Now that you have retired from competitive driving, I heard you plan to write a book. What would it be about?—Bob Langill, Folsom, Calif.*

**A.** The book I want to produce will be full of my opinions and experiences and impressions of other drivers, places, countries, types of racing, changes, feelings, motives. I'd like to tell as much as I can about racing from my inside viewpoint. Do you think it would be interesting? ★ ★ ★

*If you have questions on racing, high-performance and everyday driving techniques, send them to "Drivin' with Dan," c/o Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Questions cannot be answered by individual letters. Questions on maintenance and repair should be addressed to the Auto Clinic (see page 54).*



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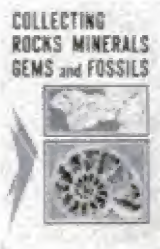


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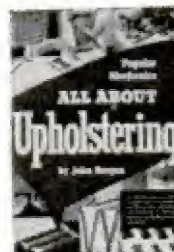
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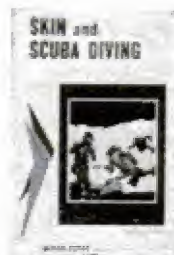


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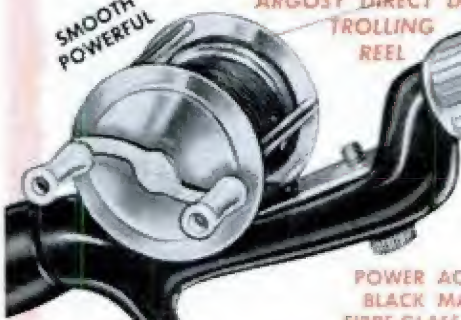
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**NEWS BRIEFS**



**Underwater jeep**

The scuba jeep, designed to carry two scuba-equipped swimmers underwater, was one of 700 exhibits at the International Boat Show in London's Earl's Court.



**Mid-air add-on**

With a baby on the way and unable to find a larger apartment that he felt he needed for his growing family, Marcel Lachat of Geneva, Switzerland, added an extension to his old apartment. The egg-shaped add-on was made of molded plastic and was set in place with the help of friends. The new room, which weighs some 600 pounds, has enough space for four people.

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WHAT'S NEW

# OUTDOORS

BY SAM MAZUR



**COMPACT FISHING KITS** are the coming thing for all traveling-salesmen anglers and the backpacker. It's another instance of a good thing in a small package. The travel case includes a spinning reel with a 5:1 gear ratio and jointed, take-down fiberglass rod (the longest section measuring less than 16½ inches). For more information, write: The Martin Reel Co., P.O. Dr. 8, Mohawk, N.Y. 13407.

## NEWS FOR LEFT-HANDERS!

And for right-handers, too. A fishing reel is now available with a foldaway handle that converts to either left or right-hand retrieve in seconds. We've also been informed by Daiwa that the reel doesn't cost much either—that's always a plus! The reel boasts a sealed ball-bearing movement, anodized snap-off spool for instant spool exchange and foolproof (or so they say) stainless-steel bail with rolled line guards. Write to Daiwa, 1526 W. 166th St., Gardena, Calif. 90247.



**BETTER FLY-CASTING ACTION** is achieved through the delicacy and lightness of a *short rod*. And since 1946 both split bamboo and glass rods have been getting shorter. A short rod offers better control of the fishing line and with practice makes it easier to catch more fish. In fact, Lee Wulff, one of the all-time greats of fly fishing, who has made *all* his catches in Europe and the United States, landed a 30-pound Atlantic salmon and cast up to 90 feet with a 1⅝-ounce rod less than 6 feet long. So forget that nonsense about better fly-casting action with a 9-foot rod weighing many ounces. The experts find it's just not so!

**PETE ALPORT**, well-known outdoorsman, writes that fishermen have been hung up on a good idea—upside down! Anglers who feel their fishing line should be invisible to the fish use colored line to blend with dark water. However, a major innovation in fly fishing is a white floating fly line—visible to the caster but, *because it blends with the light of the sky*, invisible to fish. A colored line, camouflaged to the fisherman, is visible to fish underwater. The white line is much easier for the fisherman to see and thus help him control his casting. And if he adds a 10 to 12-foot leader, the fish'll never know what hit 'em!

★★★

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**Bronc from a kit**

The Super Bronc VT-7 is a husky off-trail bike that features wide-track tires, a 7-hp, 4-cycle engine, plus such options as lights and front brake for licensing. It's a kit from Heald, Box 1148, Benton Harbor, Mich.

**Loader with a big bite**

Tiny loader is virtually lost in the maw of Clark Equipment Co.'s Michigan 675 (right), largest mechanically driven loader ever built.



**Husky little dinghy**

Spocraft's Chub, first boat made of structured plastic, is just 5 1/3 feet long, weighs 60 pounds, but can carry 550 pounds. Spocraft, Hicksville, N.Y., makes it.



MODEL 7000 HEATER

**ZEBCO will**

The Zebco TRAVELER is safer, easier to start, faster heating, and more effective than the current best seller. Actual comparison proves it. But even so, Zebco found a way to improve the TRAVELER. Handsome new grill increases protection of the catalytic element that converts clean, safe propane fuel into flameless infrared heat.

**How does it work?**

Fast. One match lights it. Full heat output in 45 seconds. Won't ignite flammable objects. Shuts off instantly. Ready for packing in seconds.

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Dial the comfort setting you want. Pad tilts up and down for directional heat. Handle stays cool. Fuel can't spill, because the TRAVELER uses safe, clean propane cylinders.

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The Model 4000 Traveler delivers safe, flameless heat and has most of the features of the Model 7000 shown here. Both come with propane fuel cylinder enclosed.

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**SO YOU THINK** you've found the right house—but what do you really know about it? The handy little booklet entitled *Check List for Buying a House* could save you hundreds of dollars and hours of time. It tells you how to check the foundation, roof, ceilings, floors, furnaces, plumbing, wiring—just about every aspect of a house. Sells for \$1 from Heritage Homes, 10 Briar Ridge Dr., Texarkana, Ark. 75501. ★★★

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This coupon good only on purchases made before June 30, 1971. Offer void where taxed or limited by law.

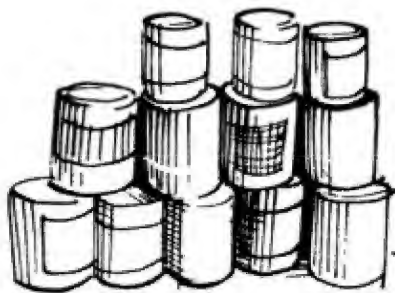
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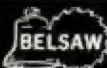
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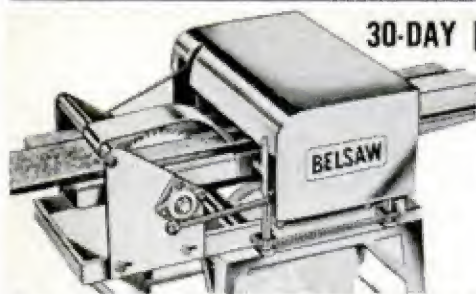
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## NEWS BRIEFS



### Reactor on the move

A special tractor had to be assembled to transport a 1000-ton nuclear reactor 40 miles to Peach Bottom, Pa., where it became part of a power-generating plant. Each track of the tractor was turned by a 350-hp diesel engine. The trip took a month.



### Alfa Romeo 33

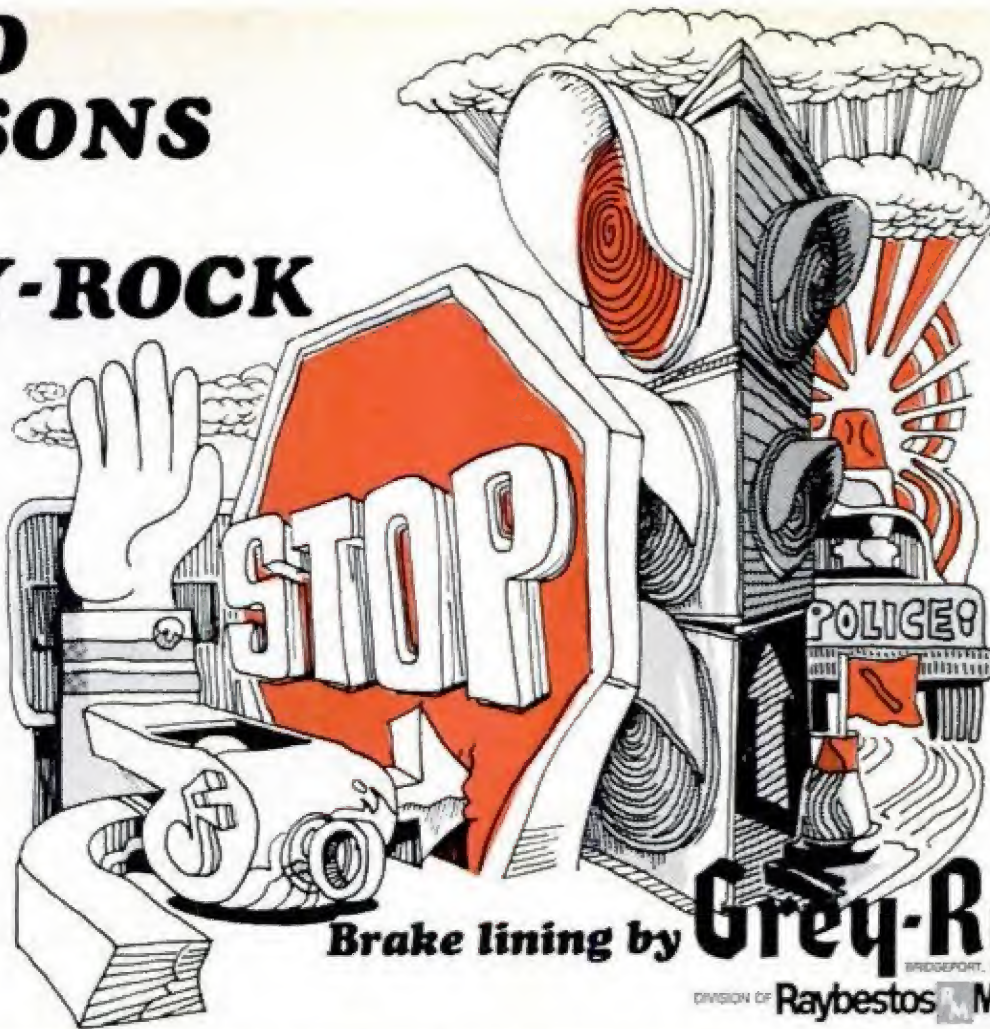
The wedge-shaped Alfa Romeo 33 Spider prototype was a feature of the Brussels International Motor Show this year.



### Electric transporter

Two drive wheels in front move the electric X-Pediter along while the passenger maneuvers a steering tiller to turn the single rear wheel. The fiberglass-body machine is designed for use as a personnel carrier in large buildings. It's available through Flagmaster Sales, Wayne, N.J.

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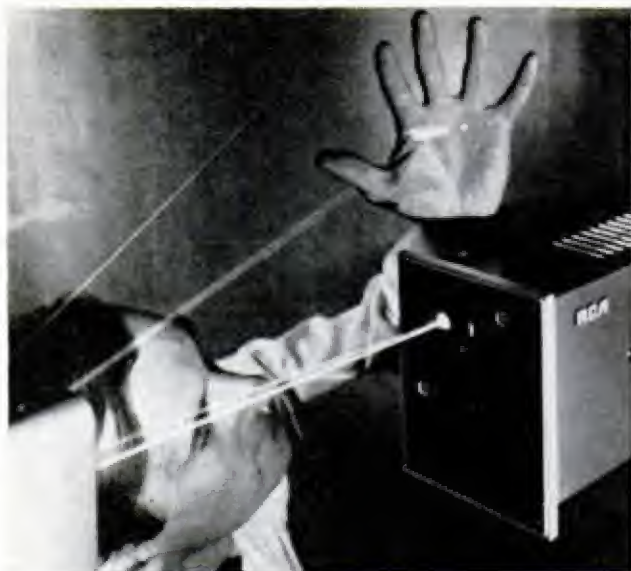
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### **Rainbow laser**

The beam from a newly-developed RCA laser is split into multicolored rays and "caught" in the palm of Dr. Karl G. Hernqvist, RCA scientist. The device, called a helium selenium laser, can produce up to 24 different laser beams in every color of the rainbow.



### **Glove seat**

Covered with baseball-glove leather, this 5½-foot-wide, foam-filled chair is an Italian designer's contribution to "pop" furniture.



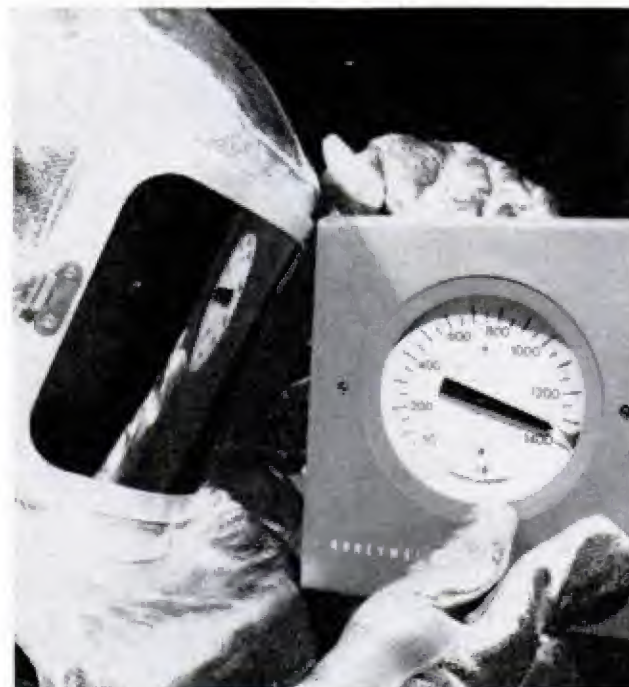
### **Bicycle built for 30**

Thirty men rode this 60-foot-long bicycle in a festival parade in Queanbeyan, Australia. They believe it the largest in the world; if it isn't they'll bolt on another section.



### **Flying inner tube**

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**BOAT LOVERS** will really go for this *PM* booklet entitled *6 Easy-to-Build Fun Boats*. It contains plans for making *PM*'s Platform Boat, the Waterbug, a 14-foot Ribless Canoe, Power or Pedal Water Bike, Featherweight Kayak and the Saucy Shingle. There's bound to be one fun-boat plan just for you. Price of the booklet is 50 cents from Popular Mechanics, Dept. WW, 224 West 57th St., New York, N.Y. 10019.

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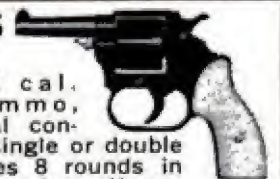


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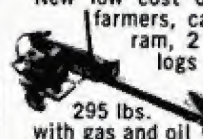
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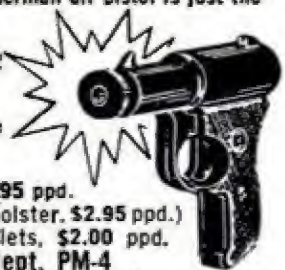
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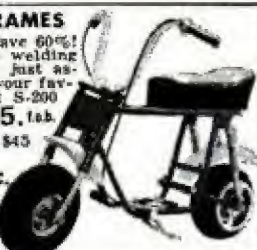
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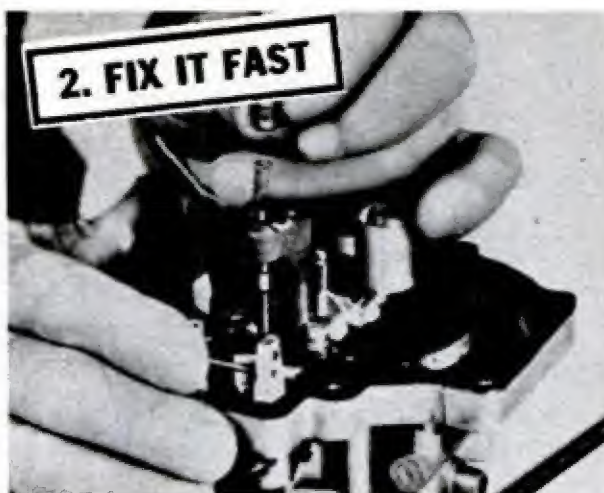
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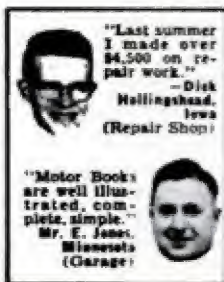


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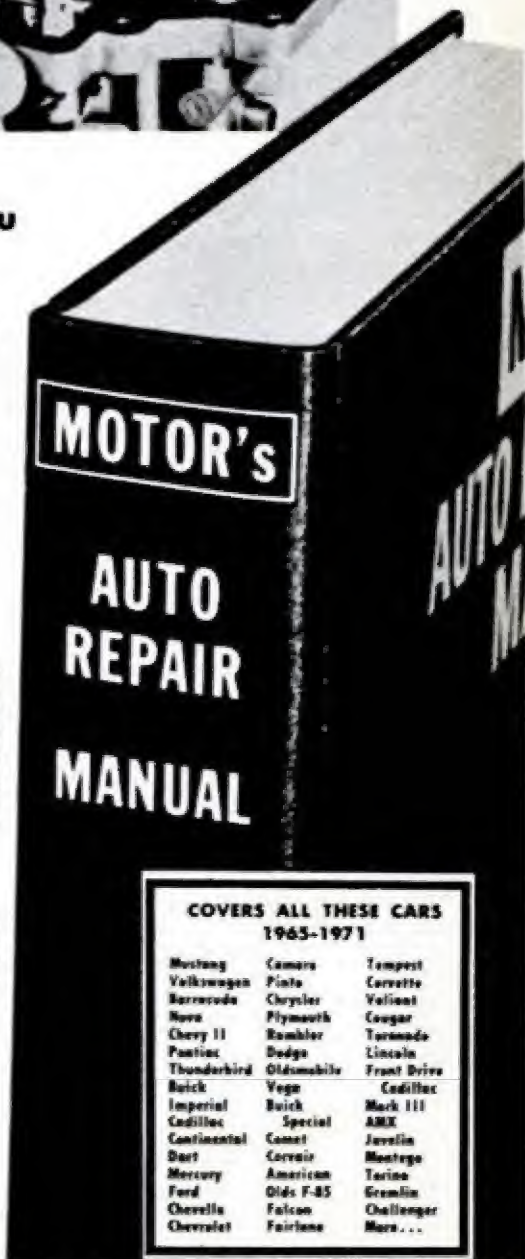
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BY MORT SCHULTZ

## Noisy transmission

*My 1970 Ford Maverick with straight-shift transmission and 200-cu.-in. engine develops a vibrating noise in high gear when accelerating between 25 and 35 mph. The noise seems to be coming from the driveshaft. My dealer tells me that it is common to all straight-shift Mavericks, but I'll remain skeptical unless you tell me it's so.—J.H. Jones, North Augusta, S.C.*

Your letter and Ford service bulletin 3057C arrived almost at the same time. A "transmission-driveshaft ringing sound," as the bulletin describes it, is common to Mavericks of your type that were built from January to May in 1970. The condition is caused by an incorrect fit between the lower, reverse-synchronizer hub and the output shaft. The cure is to remove the transmission from the car, disassemble it, and replace the output shaft with one bearing part No. DODZ-7061-A.

## Slant Six poops out

*I own a 1970 Plymouth Belvedere slant Six that cuts out completely when I accelerate. The dealer has cleaned the carburetor with no results. The condition is plainly dangerous, and I drive in constant fear of an accident. If there is no cure, I will get rid of this lemon.—Donald Hanson, Albert City, Iowa.*

Plymouth suggests that if your dealer is incapable of repairing this problem that you have him contact the regional service manager. If he wishes to take a crack at repair before doing this, he should check for a malfunction of the carburetor air-heat system, an accelerator pump out of adjustment, a float level that's too low, a main jet that's loose, missing or of the wrong size, a distributor primary lead being grounded out by vacuum advance plate movement, and an improper choke adjustment.

## Dieseling persists

*I have a 1969 Toyota Corolla which keeps running after the ignition is turned off. My dealer told me to use premium gas, which I do. He also timed the ignition and replaced my sparkplugs with hotter plugs. Now he tells me that there's a glowing protrusion in the cylinder head.*

*What course do I take?—George Kimura, Chicago.*

He could be right. However, another possibility is the auxiliary, slow-speed valve located on the side of the carburetor to prevent dieseling that results from the lean mixture which federal law requires that cars run on for lower emission. The valve may have a ruptured diaphragm. I would have it replaced before tearing into the engine.

## Off tune

*My Skylark sounds like a crow. It's a 1970 with 350-cu.-in. engine. Since the day it was new, it has produced excessive valve-train noise. My Buick dealer has installed a new rocker-arm assembly, but at 8800 miles this extremely annoying noise continues. What do you advise?—Paul F. Gerber, Stillwater, Minn.*

Buick did have a problem in its 1968 and 1969 models with rocker-arm pads breaking, but the valve train was redesigned for the 1970 models, and yours is the first complaint I've heard this year. I'd do one thing to start. Despite advertising and instructions in the owner's manual, I'd switch to a premium gas and make sure that ignition timing is on the button. A pinging condition that results from low-octane fuel and/or faulty ignition timing may give the impression of valve-train noise. If this doesn't get rid of the noise, ask your dealer to replace the pushrods, which he should have done when he installed the new rocker-arm assembly. But you never know.

## Slap dash

*My 1970 Chevrolet Nova with a six-cylinder engine and standard transmission has popped out of second gear since the day I bought the car. The linkage has been adjusted by the dealer, but the problem remains. What's wrong?—Michael J. Sinkovic, Indianapolis.*

This one's a cutie. I'm not putting you on when I tell you that what's wrong may be the physical arrangement of the gearshift. The clearance between your hand and the padded dash when you shift into second is

*(Please turn to page 56)*

Mr. Victor suggests a much longer cigarette to go with his new hairstyles.

Now everybody will be smoking longer cigarettes to go with their new hairstyles



...almost everybody.



**Camel Filters.**  
**They're not for everybody.**  
**(But then, they don't try to be.)**



## AUTOMOBILE CLINIC

(Continued from page 54)

only  $\frac{3}{4}$  inch, if that. As you shift, your hand may be striking the dash, limiting your movement and preventing full transmission engagement. If it isn't fully engaged, the shift lever will pop out. Try using two fingers on the bottom of the lever to shove the lever fully into second. If this doesn't work, the trouble may be caused by damaged teeth on the second-gear, synchronizer, sliding hub. If this is the case, have the synchronizer replaced.

### High oil mark

*How is transmission fluid getting into my engine oil? The car is a 1964 Ford Fairlane 500 with automatic transmission.*—John E. Tendick, St. Louis.

Engine vacuum is pulling the fluid from the transmission into the crankcase through a bad modulator valve. Replace the valve.

### Odd-acting gauges

*I have a 1970 Ford Torino with 351-cu.-in. engine and the craziest gas and temperature gauges you've ever seen. Depending on what they feel like doing at that particular time, they will shoot past normal and stay there, or they will go only to normal. The Ford mechanic tells me that he can't tell what the trouble is unless he can see the gauges act up which, as luck would have it, doesn't happen in his presence. Can you help?*—Dewey R. Fox, Argos, Ind.

Honestly, I don't know where some mechanics get their training. Obviously, the condition is being caused by a shorted, constant-voltage-control unit behind the dash. A mechanic should be able to tell this just by listening to your complaint. Have it replaced . . . the mechanic, too.

### A rightest leftest

*The front brakes (standard) of my 1965 Pontiac pull violently to the left and occasionally to the right. In some instances, when I stop for a traffic light, there will be alternate pulling to the left and to the right until the car comes to a complete halt. The car has been in and out of service shops for regrinding of the backing-*

*plate contact surfaces, new drums, shoes and linings. The problem persists. Please help.*—J. I. Barta, Winnipeg, Man., Canada.

The problem persists, because it may not be the brakes, but worn suspension parts. The occasional alternating in pulling that you get may occur when a road configuration exists that permits looseness in suspension to be affected on both sides.

### Rust without water

*Oil on the dipstick looks rusty, so water is getting into the oil of my 1965 Dodge Dart—right? What do I do about it?*—Jim Wheeler, Mount Clemens, Mich.

Wrong! If water was getting into the oil, the oil would look white, like cream. That "rust," which isn't rust at all, is a result of the detergents in the oil you're using. No need to worry about it.

## Service Tips

- **AMC has changed its mind** concerning which sparkplug to use in its 1971 six-cylinder and V8 engines, so forget what the manual tells you. The one the company recommends is the Champion N12Y.
- **Front disc-brake squeal** in 1969 and 1970 Cougars and Montegos can now be eliminated by taking your car back to the Mercury dealer and having him replace shoes and linings with new ones carrying part No. D00Z-2001-C.
- **Chrysler Corp.** has found that coolant is being lost from 1970-model radiators, including Dodge trucks, because the pressure-cap gasket swells. The problem occurs in high temperature after the engine has idled awhile. If this has happened to you, have the dealer replace the cap with one bearing the markings S M C O.
- **Different brake-fluid color** at one part of your new Oldsmobile's braking system (the master cylinder, say) than at another part (a wheel cylinder, say), is nothing to worry about. Some parts of the brake system were color-coded with vegetable dye during manufacture to facilitate the assembly of the system. The brake fluid washes the dye off, which colors the fluid. Don't bother to flush the system. The coloring doesn't affect fluid quality. ★★

---

**GOT A PROBLEM WITH YOUR CAR?** Ask Mort about it. Send your question to Auto Clinic, Popular Mechanics, 224 West 57th St., New York, N.Y. 10019. Letters cannot be answered individually, but problems of general interest will be published in the column.

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I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pinch of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillacs, my winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a humdrum life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read; but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to levels of independence beyond the dreams of avarice.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things, of innumerable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can think your way to riches without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be *earned!* I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

## I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. And, in addition, I have the satisfaction—the deep satisfaction—of knowing that I have put more than three hundred other men in businesses of their own. Since I have no need for money, the greatest satisfaction I get from life is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to

gain his position. And, unless you are willing to make at least half the effort, I'm not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the secret I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

## A Fascinating and Peculiar Business

I have a business that is peculiar—one of my businesses. The unusual thing about it is that it is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And, it is a business that can be started on an investment so small that it is within the reach of anyone who has a television set. But it has nothing to do with television.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

## Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will keep your "factory" running 24 hours turning out a product that has a steady and

ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in becoming your own boss, in knowing the sweet fruits of success as I know them, send me your name. That's all. Just your name. I won't ask you for a penny. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about the business I have found to be so successful. After that, you make the decisions.

## Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in the kind of independence I enjoy. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness and prosperity to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of this proverb. And what I send you will not cost a penny, now or at any other time.

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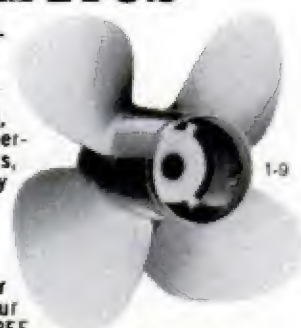
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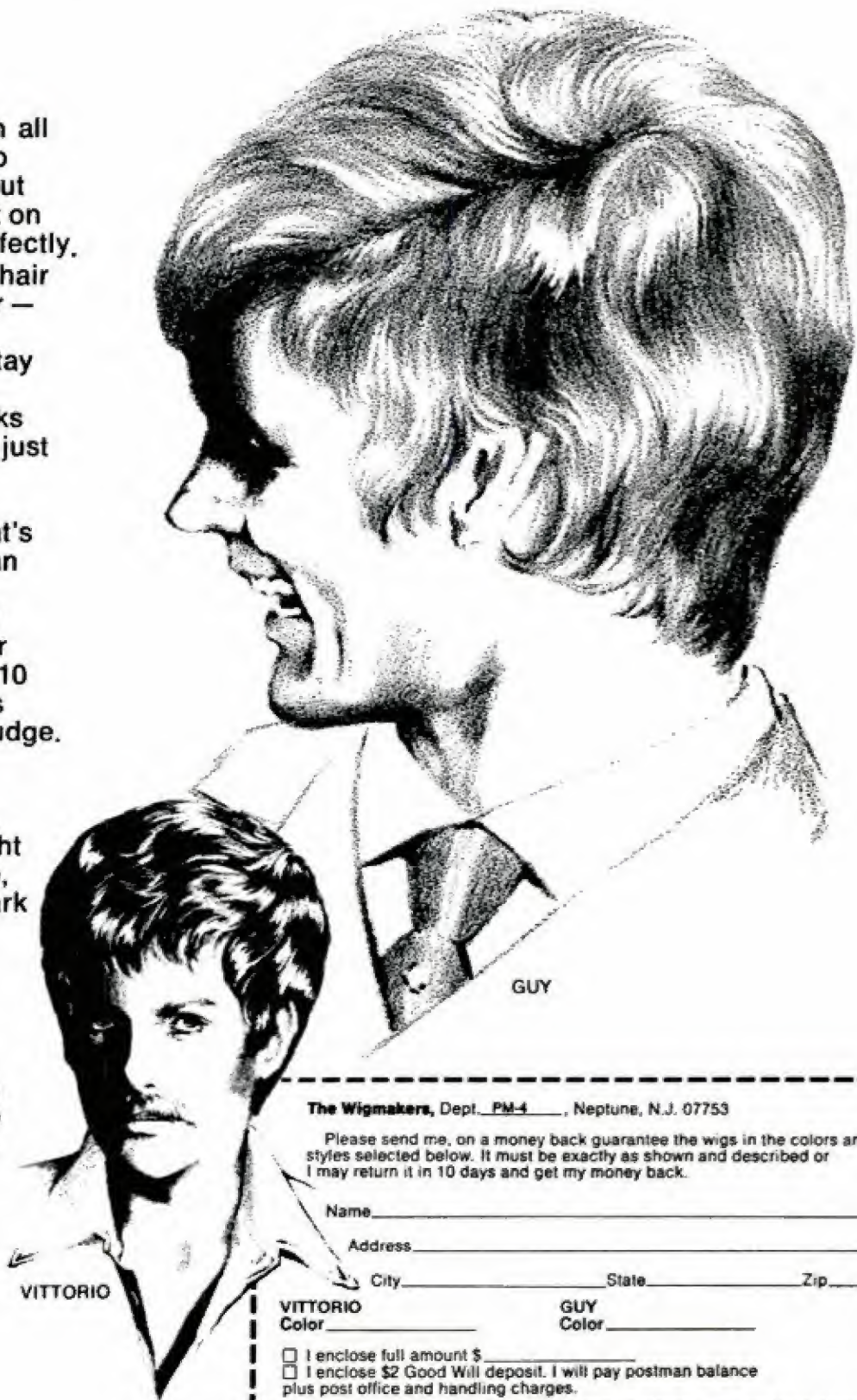
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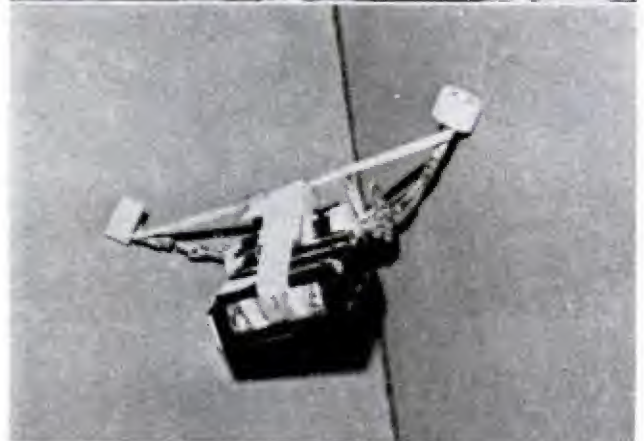


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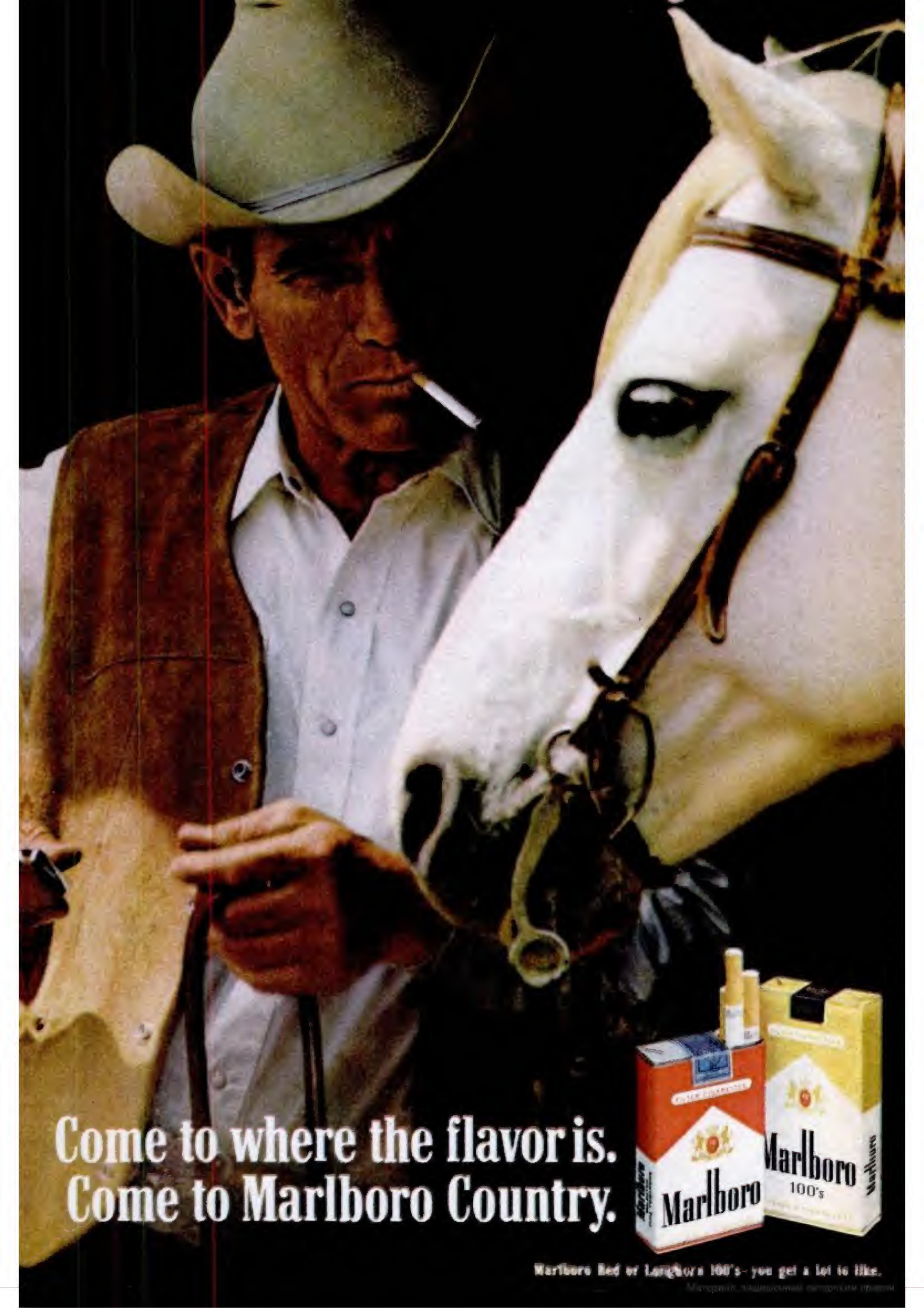


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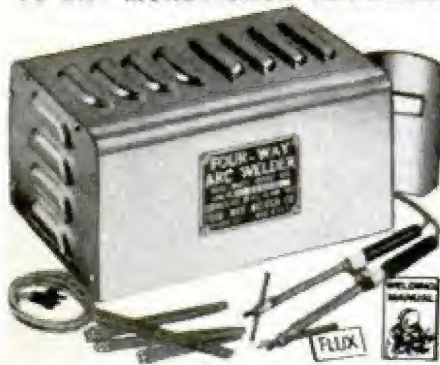
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BY V. LEE OERTLE

**CONGRESS ABOLISHES PICKUP CAMPER TAX.** At the very last minute, the 91st Congress approved a bill that eliminates the 8 percent excise tax on pickup covers. As a result, there will be a \$3 million saving for consumers each year. The action was brought to a successful conclusion with the help of continuous strong support from manufacturers.

**ANTISKID TRUCK BRAKES ANNOUNCED BY IHC.** Yes, International Harvester Co. is the first truck manufacturer to install an antiskid system on light-duty pickups. Applied to the rear wheels, the system is designed to exercise positive control over side-slip when braking on any surface, including snow, mud and ice. The idea is to prevent wheel lockups, thus eliminating slides. Even when only one side of a truck is riding on a slick surface the antiskid device still works, according to IHC. All light-duty International trucks and Travelall station wagons will offer the device on late 1971 models.

**FORD ANNOUNCES SPECIAL MOTOR HOME CHASSIS.** This long-awaited move by the Ford Motor Co. evoked little surprise but plenty of interest. Tagged the M-series, the M-500 will have a GVW up to 13,500 pounds on a wheelbase up to 178 inches. The M-400 will ride on a wheelbase of up to 154 inches with maximum GVW of 10,000 pounds. The M-350 will carry a wheelbase of up to 122 inches and maximum GVW of 8000 pounds. All M-series Ford chassis will offer outside-access service panels, cable-type accelerator and automatic transmission linkages, outboard steering column, and full instrumentation.

**CAMPSITES APLENTY BY 1972!** That old saw about a "campsite shortage" will be buried forever along about summer, 1972. In fact, recreational vehicle travelers will begin to notice an unusual abundance of campsites available in good locations *this season*. Most will be located near national parks and monuments, near large cities, and at key crossroads where tourists pass. This new campsite bonanza will be the result of fantastic growth of private campgrounds and franchised chains. The number of new sites could increase by 100,000 in the next 12 months!

**FEDERAL GOVERNMENT WILL DEMAND ROLL-OVER TESTS FOR TRUCKS** during the years ahead. It wants pickups to be able to withstand a 360° roll-over with *no fuel spill* from gas tanks. Pickups must be able to ram a brick wall at 30 miles per hour *in reverse with no fuel spill* from gas tanks. The motive is to produce pickup trucks able to withstand severe impacts and roll-overs without spilling fuel which can catch fire. The result will be a much safer vehicle, but Detroit truckmakers are frowning at the problems involved.

**PROTECTION AGAINST MOB ACTION IN OUR NATIONAL PARKS** will be greatly improved if Congress passes legislation approved by the budgetary committee of the Department of the Interior to increase National Park Service funds by \$660,000. Triggering the action was testimony about chaotic conditions in Yosemite Valley last July 4 weekend when some 700 young vandals were reported to have seized a park intersection, built a huge log bonfire and, as "thousands" of campers watched, attacked 37 rangers with sticks, bottles and fists. Supt. Larry Hadley had requested more financial aid for his park (Yosemite) to help control such a problem. Narcotics were said to be chiefly responsible for the disturbances. Some of the proposed funds are specifically intended to provide a specially trained cadre of men for the expert handling of unruly mobs in the parks. ★★★



Drill holes. Or swamp it with a full load of 570 lbs. It stays afloat because there's foam flotation built in under the seats.

And it's more stable than other boats. The hull design's the reason. It's unique for a 12-ft. boat. A marine architect used advanced hydrodynamic principles to do it.

And this boat's built for fishing full time. It's one piece of fiber glass. No seams or rivets to leak.

Ted Williams added his ideas, too. Bait well, measuring scale, rod holders—built into the boat.

The "Gamefisher." In a Sears Sports Center. Or Sears Catalog.

**FREE FISHING CATALOG.** For a free copy of Sears 1971 Fishing and Boating Equipment Catalog, mail coupon to: Sears, Roebuck and Co., Dept. 139-P2, 925 S. Homan Ave., Chicago, Illinois 60607.

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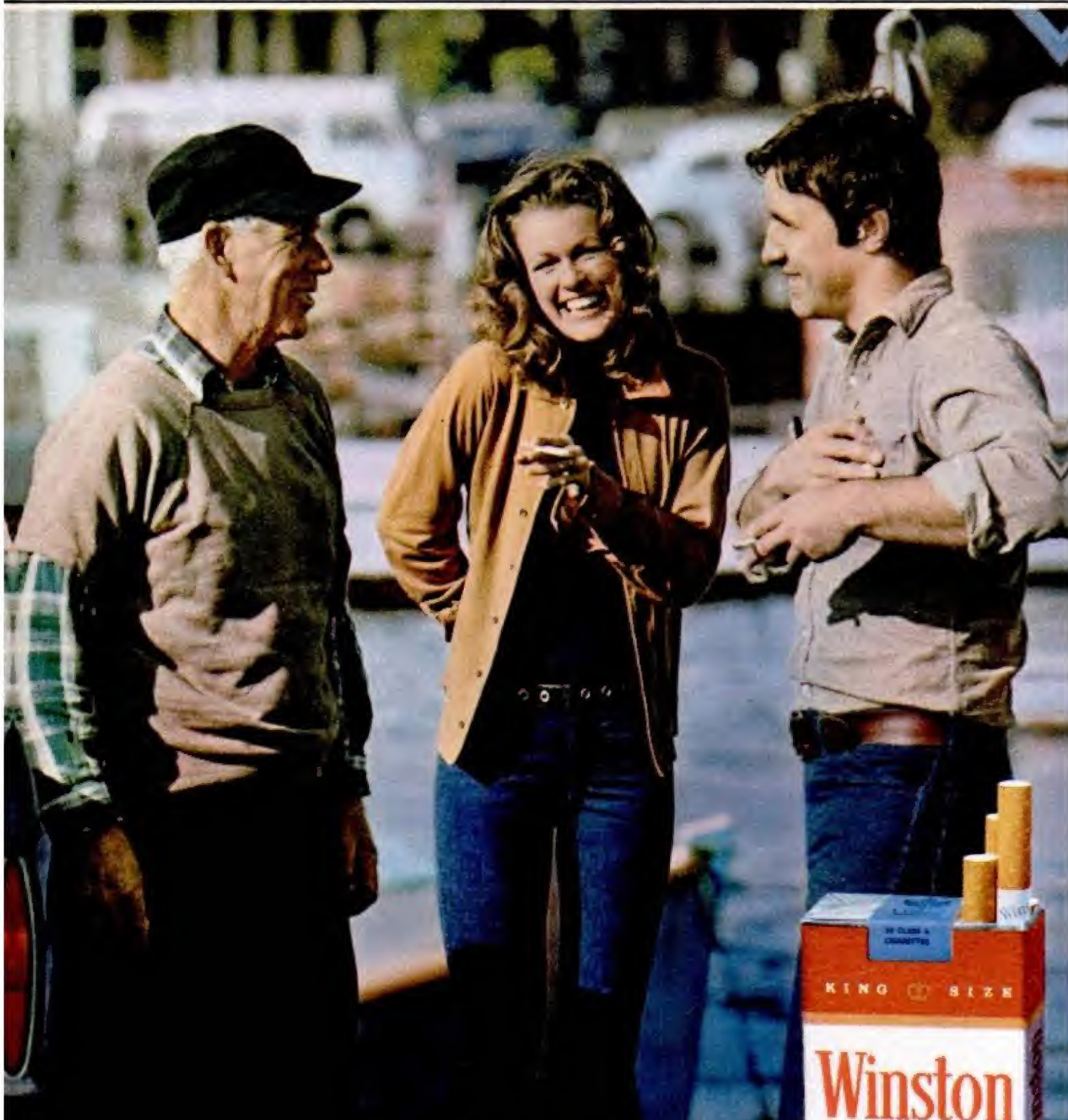
**Sears**   
**SPORTS CENTER**  
home of the Ted Williams brand

# The "Gamefisher."


## It won't sink. Even if you drill holes in the hull.



# WINSTON'S DOWN HOME TASTE!



**Real and rich and good**  
like a cigarette should.



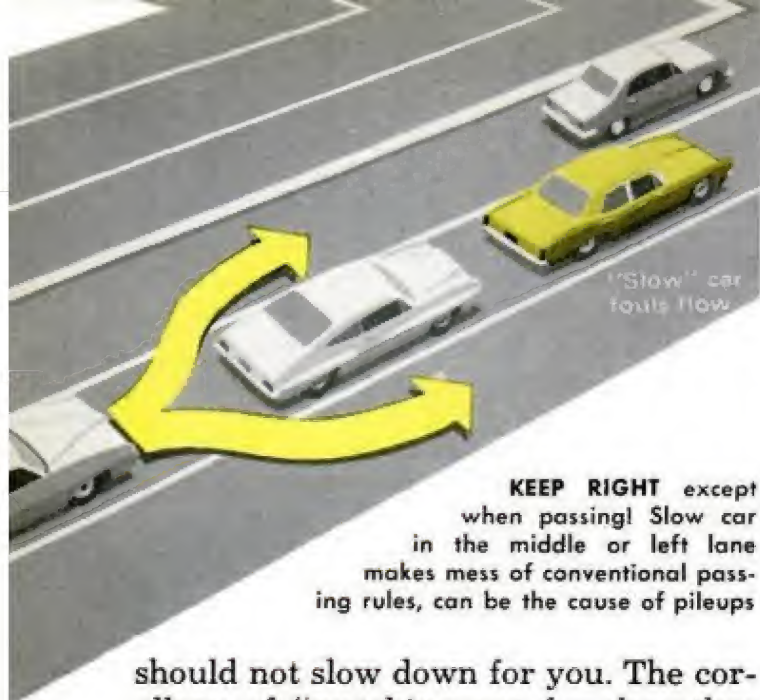
**BE SEEN!** In the rain, on a gray day, even in daylight, use your headlights and you'll minimize the chance of another driver not seeing you and pulling into your path

# 10 Driving Tips That Could **SAVE YOUR LIFE!**

The flow of traffic is fast and fierce in modern driving and demands first consideration. Part of your safety—and the other guy's — is in driving so you don't foul the flow

By E. D. FALES JR. / Illustrations by Dale Gustafson and Roy Grinnell

**T**HERE'S A RULE about driving on today's roads and superhighways. A rule that PM's Auto Editor, Bill Hartford, (with thanks to Newton) calls the Inertia Rule: A car—or traffic—moving at 40 mph wants to remain at 40 mph (or 70 mph, if that's the speed), and will stay at this speed unless acted upon by an outside influence. Your driving actions should not affect this flow of traffic. A common example is the proper use of a parkway entrance ramp for building up speed so you can phase into traffic. It's like running so you can jump on a moving merry-go-round. The entire merry-go-round



E.D. Fales Jr. is the author of *The Book of Expert Driving*, published by Hawthorn Books, Inc., which includes excerpts from several of his automotive articles written for PM

What Prof. Toth is calling for is really a set of "thinking man's survival rules." Not only will the following rules and tips save your life, but they can keep your insurance premiums down! By preventing even a single bad fender-bender, their application can save you a big jump in premiums.

should not slow down for you. The corollary of "watching out for the other guy" is considering the other guy (and the traffic flow), because very often you'll be saving your own skin.

With rising speeds—which jump annually, according to the National Safety Council—we're entering a new era of driving. The potential for split-second accidents is rising as speeds go up on more and more crowded roads.

Because of this, Prof. William J. Toth, New York University driving expert, is especially concerned with updating our driving habits. "It's no longer enough just to think of 'defensive driving,'" he says, "nor is it enough to tell drivers, 'Speed kills.'" How do you reconcile that with the fact that most fatalities occur at 45 mph or less? Or, pointing out that it's the *slow driver* who is the cause of many wrecks on superhighways? Nor is it enough to say "keep your distance." How can you if you're in traffic with three other cars running a deadly chain at 70 mph only a few feet behind you?

**1. Be Seen!** Use your headlights in rain (in some states it's law); get them on by dusk, not when it's dark. This is not so you can see, but so *other cars can see you!* A driver in a car with fogged windows has diminished visibility: Help him see you. How about using headlights around the clock? Conducting many tests, one of the best vision experts in the driving field, Indiana University's Prof. Merrill Allen, found that drivers coming toward you on narrow roads give you as much as a yard extra room if they see your headlights on. Obviously this adds up to a tremendous safety factor in your favor.

And now the New York Port Authority, which runs a big fleet of cars and trucks, has found that *lighted vehicles simply don't have as many accidents* as unlighted vehicles. Even having parking lights on gives other drivers a much sharper awareness of your car. And taillights in the daytime seem to sharpen their wariness when following you.

At night when you see a car running with no lights at all—do the driver a

**COMMUNICATING WITH YOUR CAR** can be as simple as pulling over a bit to allow the driver behind who wants to pass to see road ahead, and to "say" to him, "Go ahead. I'm cooperating with your intentions"





**TEMPTING WAY TO SAVE SECONDS** is the dangerous wide-arc turn. You can get into trouble halfway through it and your car will be off balance for the emergency

favor: Blink your lights at him. Chances are he forgot to put them on and your tip could save his life.

**2. Be Heard!** This rule isn't a call for more horn use in a traffic world that's already deafening! What it means is, from now on, give *selective* signals. Your horn should not just blare: It must send out messages—every message tailored for the emergency.

A car in the rain, with steamy windows, for example, may be blending heedlessly at a feed ramp. If it keeps coming you're going to get hit. You can't stop. *Don't* mash the horn in the usual, excited warning blare. Instead, rap it with your fist—hard—in a lightning-fast series of chords.

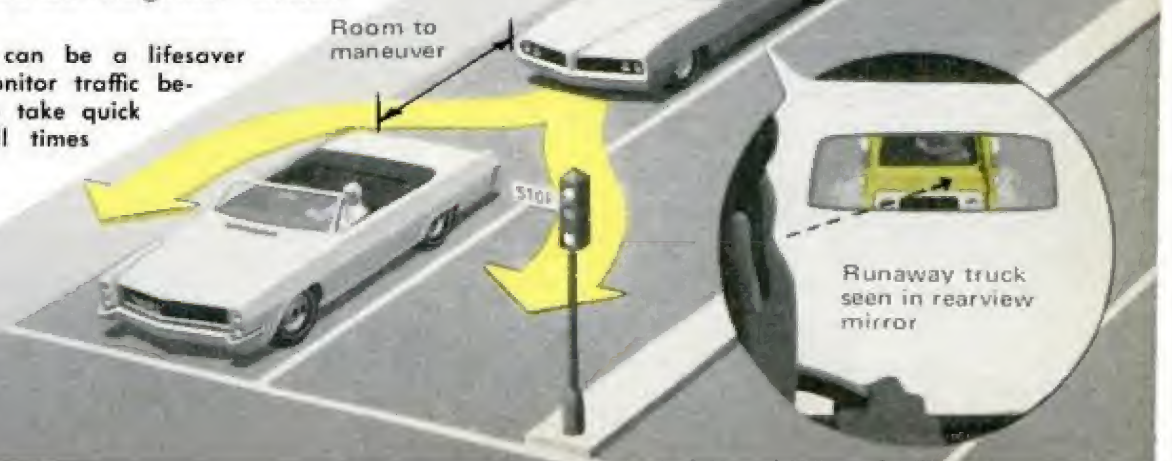
There's a need today for more controlled horn talk. A long blare confuses and frightens. But quick, brief hits serve two purposes: (1) they don't anger or confuse; and (2) even if the other driver doesn't see you they tell him (a) the degree or urgency, (b) where your car is moving, and (c) the speed at which it's moving. He "reads"

your "dits"; a long blare can't be read.

**3. Observe Lane Discipline!** Most drivers have taught themselves certain hard-nosed disciplines. They *always* stop at red lights. They *always* observe stop signs, and so on. But one of the best—that hasn't been taught—is what Bill Hartford calls "lane discipline": *Keep right except when passing!!*

This, more than ever, is a most important discipline needed in high-speed, multilane traffic situations. It is a discipline that should become habit, and be divorced from any notion that you can drive in any lane you choose if you're driving at the posted speed limit. There are many parkways and highways where, rightly or wrongly, the overwhelming majority of the traffic moves anywhere from 10 to 20 mph over the posted

**REAR-VIEW MIRROR** can be a lifesaver when its used to monitor traffic behind. Be prepared to take quick evasive action at all times





**WAITING TO MAKE A LEFT TURN**, car in yellow has lined up with the center island to allow traffic to flow. No law requires this, but the action can prevent pileups, save rear fenders from being nicked

limit. Tangled knots of traffic on six-lane highways (three in each direction) are almost always due to a handful of drivers not observing lane discipline.

There will always be the reckless, dangerous and abrupt lane changer, but lane discipline will minimize excessive lane changing by the "normal," brisk drivers whose patience has been severely tried by being constantly trapped behind "slow" cars that linger in passing lanes. Some rules of lane discipline are as follows:

Choose your most practical "working lane" and settle down in it—adjusting your speed to meet conditions best. If you're slow (but not below the minimum speed limit!) work the slow (No. 1) lane. If you're sort of average, work the middle (No. 2) lane—as long as you're passing cars in the No. 1 lane! If you're not, move into the No. 1 lane. If you're hot, work the left (No. 3).

**4. Make Your Car "Talk"!** Until now a lane has always been just a lane. You used any part. There's been no real science to lane use. But now, as Prof. Toth emphasizes, it's important at times to run close to the left lane-stripe, in the middle at other times, and near the right stripe at still other times. This "in-lane maneuvering" depends on what you're about to do, whom you want to see your car and what you're trying to "say" to drivers behind you.

You can talk to other drivers with your lights, your horn and your hands.

But your most effective tool for communication, usually overlooked even by experts, is *your car itself*. No one tells you this in most driving books, but you can actually make your car send several important "messages."

Pulling a few inches to the right on a two-way road, for example, is a decent way to invite the driver behind you to go ahead—when safe. It says, "I'll cooperate." Pulling toward the center stripe says: "Hold everything. Don't try to pass just now." (But it's important to pull over to the "invite-to-pass" position as soon as you can.)

Holding to the center-of-the-lane position tells drivers behind you: "This is normal traffic—from where I sit."

Veering *slowly* an inch or two at a time toward the left stripe says: "I'm getting ready to turn left. Watch for my turn and brake lights."

When you approach a slow daylight intersection and see oncoming cars waiting to make a left turn *in front of you*, your car can also state your intentions. By *veering to the right a few inches* (perhaps also turning on your headlights) you indicate: "Wait, I'm coming on through." Or, if you're already down to slow speed you can say clearly: "Go ahead. I'll help you." This is done as you get to crawl-speed by locking up your brakes for just an instant (if no one is behind). As you hold the brakes, the car nose dips, clearly telling the other driver that you are prepared to make a full stop for him.

All drivers, says Toth, become "predictors." And in this lies the whole secret of "car talk." Whether or not we realize it, we drivers now study each

other's car movements as intently as we study expressions on faces when talking. We now usually *know accurately* what the other driver's car is going to be doing—within a tolerance of mere inches and split-seconds. Any variance from this becomes a message of importance. Thus you can "say" a great deal in split seconds, *by not doing quite what your car normally does!*

If, for example, there's a little mixup ahead and the driver in front of you has to use brakes, quickly snap your car to the right—four or five inches. This lets the driver behind you also see the brake lights of the car ahead when they come on.

If you're overtaking, but see that the car ahead that you're about to pass is getting "boxed" by a slow truck further ahead, help him by taking one of two actions: Rush your overtake so he won't get trapped in a hard deceleration behind the truck or slow down a little and pull to the right slightly. He'll recognize this in-lane maneuvering as a sign that you're holding and are letting him pull out of the box.

**5. Tuck Your Tail!** When you're making a right turn from a fast road, don't loiter in the turn and risk being the cause of collisions behind you. Prepare other drivers for your turn by proper in-lane maneuvering and a turn signal. Once the turn is begun, carry through! It protects your car's rear end and other drivers from the "squeeze" collisions that happen at corners.

What if there are pedestrians in the crosswalk? Still, try to maneuver so you won't have to stop *after* you begin the turn! It's wiser to block traffic in the main artery than to get hit halfway into the turn—and having your car hurled into pedestrians.

**6. No Wide-Arc Left Turns!** For left turns across fast traffic, first, begin in-lane maneuvering—slowing slightly and drifting toward the center stripe. Don't slow down too early because it irritates drivers behind who start jock-

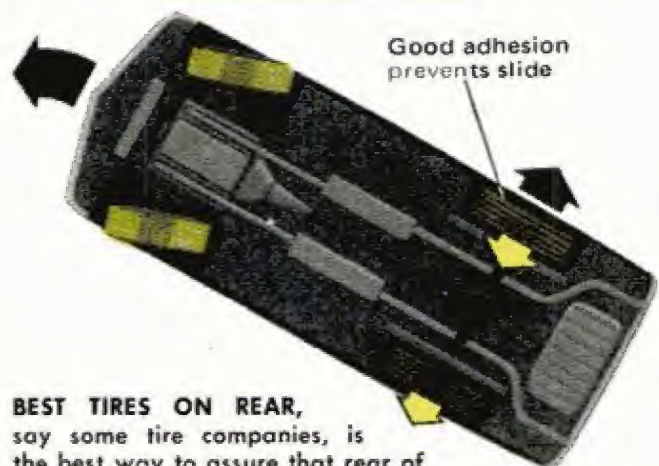
eying to squeeze around you at high speed, and can result in pileups.

When you are a block from the corner where you intend to turn, signal and start braking. Begin turning only when you are into the intersection. Then make it a brisk and controlled left turn. Dangerously, many drivers look for an opening in traffic from the opposite direction and then make a fast, sweeping, wide-arc turn. If pedestrians suddenly appear, the turning driver may suddenly be out of control from braking while his car is leaning off balance. His view may be blocked by the left-corner post—an even more dangerous situation.

**7. Look Out Behind!** You can save a rumpled rear end or even your life by using your rear-view mirror for more than just changing lanes. If you get in a tight situation and hit your brakes hard, check your rear view the instant you know you're not in trouble ahead. If the driver behind has been dreaming and you see him closing in at a rate that spells collision, you can let off your brake enough to bring you closer to the car ahead but give the guy behind a bit more room to stop, or you can take maneuvering action off to the shoulder before he hits you.

Also use your mirror in this manner when stopped at a traffic light, especially if you are the last car in the line. A habit of watching behind is easy to get. When added to a habit of keeping

*(Please turn to page 116)*



**BEST TIRES ON REAR,** say some tire companies, is the best way to assure that rear of the car will follow the front in a turn and not slide out, possibly causing the car to spin



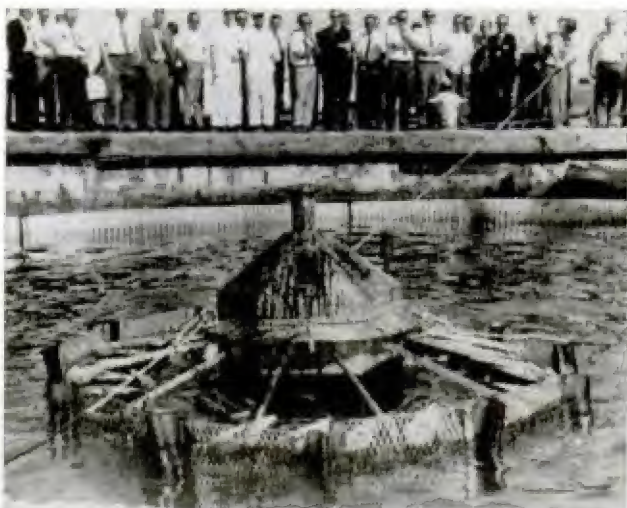
### **Twin-jet train**

Russian engineers expect speeds of up to 160 mph from this twin-jet railroad car. Called the SVL, it was designed by rail and aviation men.



### **First Harrier delivered to Marines**

This VTOL demonstration was part of the ceremony marking delivery early this year of the first of 12 Hawker Siddeley Harriers (*The Plane That Makes Airfields Obsolete*, page 80, June '70 PM) to the U.S. Marines.



### **Cleans up oil spills**

By pulling in oil and separating it from water, this device can clean up oil spills in harbors. A larger one operates in open seas. The maker is Reynolds Submarine Services.



### **Wall against jet noise**

A 50-foot wall of concrete plates attached to metal posts protects nearby homeowners from jet noise at Frankfurt's Rhein-Main Airport. The wall is nearly two miles long.



### **Harley for snow**

After putting some 100 of its new snowmobiles through a winter of field testing, the Harley-Davidson Motor Co. plans to offer the machine through its dealers this fall. The red, white and blue snowmobile is powered by a 398-cc, twin-cylinder engine manufactured by the firm. One of its options will be manual or electric starting.



## Build PM's Jeanie

"It flew like a dream," was the enthusiastic flight report from Maj. Ralph Hess, USAF (Ret.), after he flew the Volkswagen-powered *Jeanie's Teenie* (page 120, May '68 *PM*) built by his Air Force Junior ROTC cadets at Coos Bay, Ore. Cadet-builders Don McCabe and Joe Beebe are shown. Due to great reader interest, *PM* will show an improved version, *Jeanie's Teenie II*, next month.



## Toyota's mobile school

A school on wheels, complete with eight work stations (left), electronic teaching program and auto components, has been provided by Toyota for its service technicians. The van, first of a fleet, will be based in Denver and serve the nearby Western states.

## Wildest air race

Flying against each other in one of the strangest arrays of competing aircraft ever seen—they ranged from fighters to a DC-7—20 planes raced in the California 1000, going 66 laps around a 10-pylon circuit. The only limitations on aircraft were that they have piston-powered, internal-combustion engines and propellers. Winner of the race was Dr. William S. Cooper of Merced, Calif., who flew a modified Hawker Sea Fury (below) at an average of 340 mph. Wally McDonnell (above, right), piloting a B-26, stays on the tail of LeRoy Penhall's P-51 Mustang. Planes racing included 11 P-51s, two Hawker Sea Furies, two F-8s, two F-4Us, one P-38, one B-26 and one DC-7. Fuel use ranged from 150 to 300 gallons an hour for the fighters to 5000 for the DC-7.





### **Finds position by satellite**

Ready for field-testing by the Marines is Honeywell's new position finder. The device uses signals from the Navy's Navigation Satellite System to give the user his exact location on the Earth's surface. It can be used by surveyors as well as the military.



### **Soviet moon rover**

The Soviet Lunokhod-1, which was moving over the surface of the moon early this year, is shown in the top photo during prelaunch tests on Earth. In the bottom photo are the technicians who control and monitor the moon rover at the Soviet Lunodrome.



### **First F-14 does well—once**

After one successful test flight, Grumman's new F-14 (A Hot New Fighter for the Navy, page 83, Jan. '70 PM) suffered failure of three hydraulic systems on its second flight and crashed. The ill-fated plane, shown here during its initial flight, was the first of 12 test planes slated to be delivered to the Navy before the end of this year.



COMING...

# The Incredible Skyshark—

# First Amphibious

# Jet

By MARTIN CAIDIN, Author of *Marooned*

*It's designed to cruise at 550 mph at 30,000 feet, operate from land or water bases and have STOL capability. Key to its revolutionary performance would be a telescoping wing.*

**L**AUDERDALE TOWER, Skyshark One Six Alpha, number one, ready to roll. Over." The traffic controller in the airport tower studied the arrowhead shape through binoculars.

"Skyshark One Six Alpha, move into position and hold."

The sleek jet taxied onto the runway and stopped with its nose into the wind. Staring at the Skyshark, the tower operator nudged a colleague. "What is that thing?" he asked. He couldn't decide if it was an airplane or a futuristic speedboat. Far back on the fuselage behind raked wings were two jet engines beneath a swept-back, high tail. The nose appeared to be an expanse of plexiglass. He saw two pilots with a panoramic view of the world.

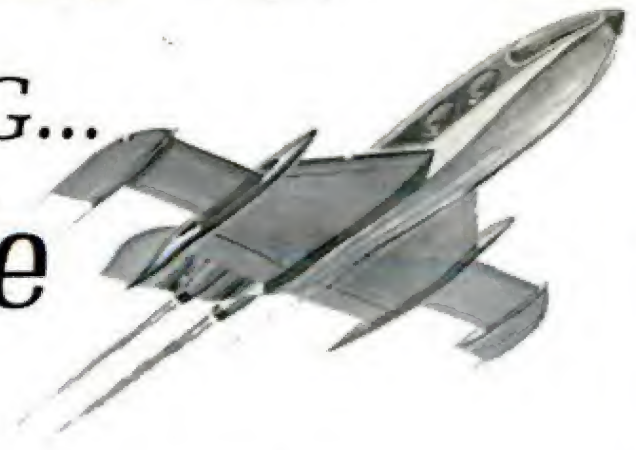
"I guess this is the first time you've seen one of those," the second tower operator said. "Ask him to make a max performance takeoff. Then hold on to your hat!"

The first man nodded. "Skyshark One Six Alpha cleared for takeoff," he said into the mike. "Would you mind showing us what the thing can do?"

"Roger, tower. Rolling now."

The men in the tower stared as the Skyshark sped down the runway. Then, only 600 feet from where it had started to move, the plane's nose came up. The gear snapped out of sight and the nose went higher, higher still, until the Skyshark was a dot in the sky.

This is a description of a takeoff that has yet to happen. Skyshark is now being tested in wind tun-

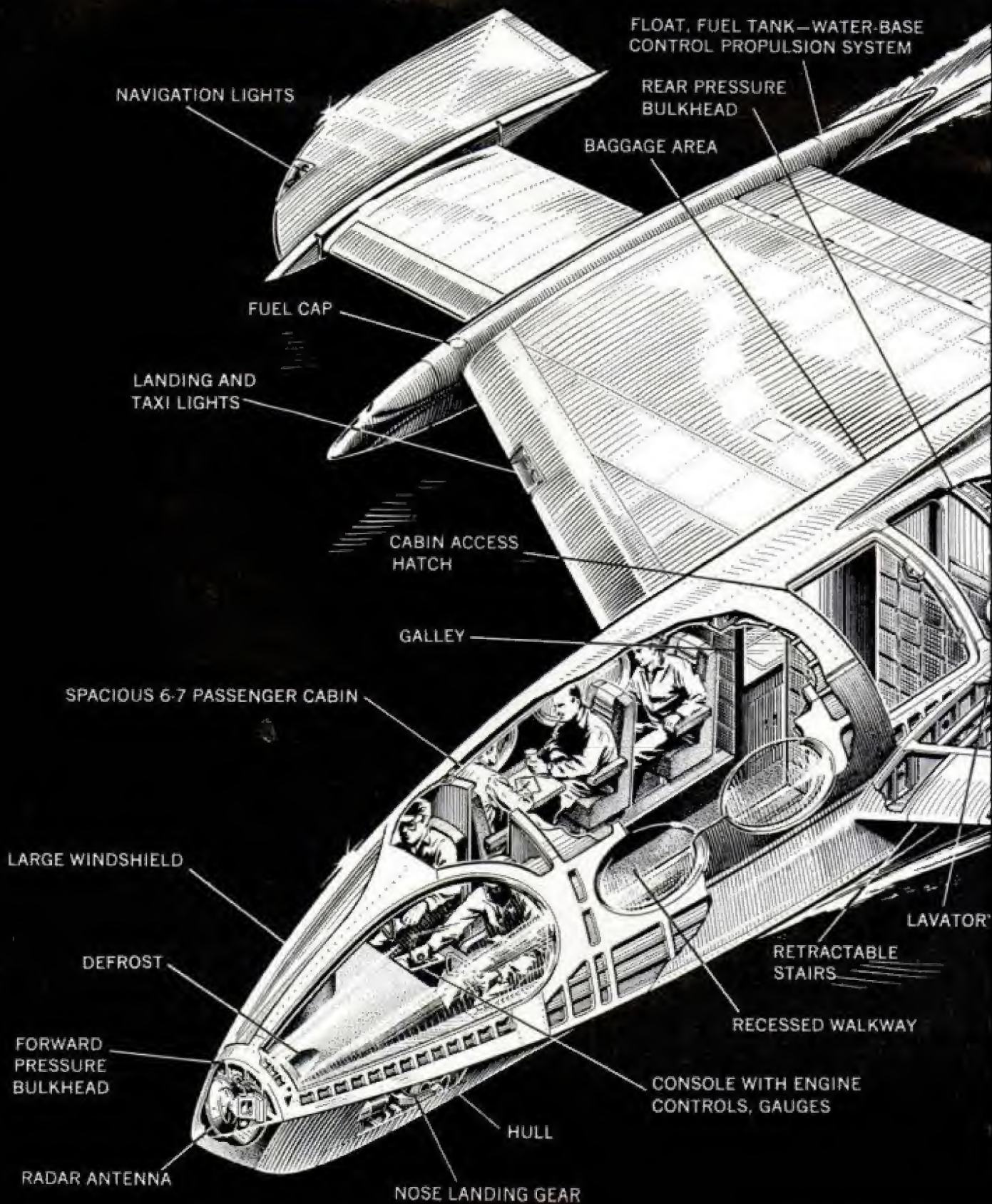


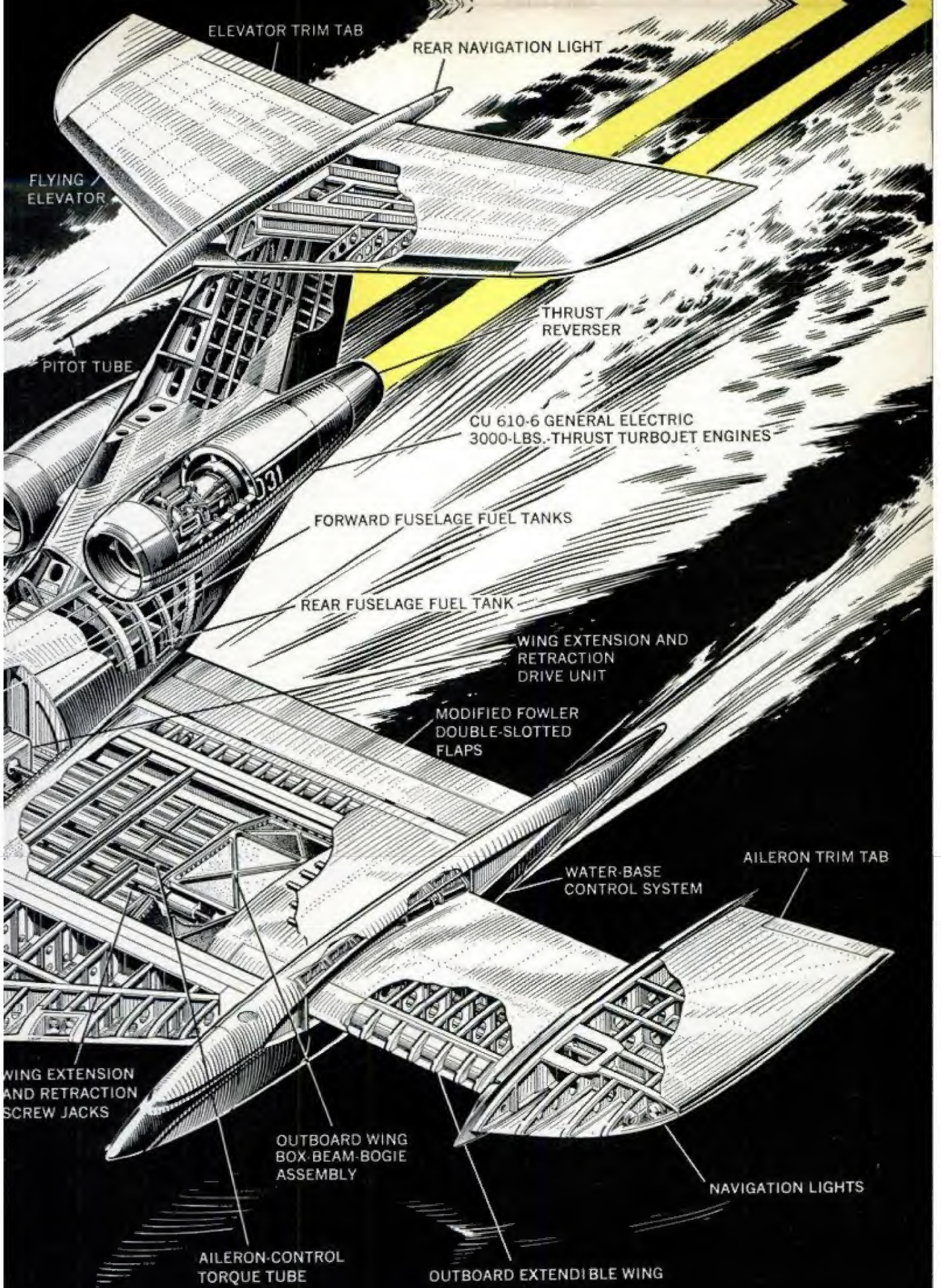
nels and being prepared for its first mockup. The concept is now stirring excitement among the flying fraternity throughout the country. And for a good reason: It's the first small jet designed to operate from land or water.

Skyshark is the brainchild of a Florida surgeon, Dr. G. Leonard Gioia of Merritt Island. The physician is an instrument-

rated pilot who flies his own Aztec and is something of an aeronautical engineer, to boot. He and two other men—Norris Switzer and John Willerton—have worked together for years to bring the new design through its engineering birth pains.

Switzer, who cut his teeth designing the P-40 fighter that the Flying Tigers used early in World War II, is a rocket





ELEVATOR TRIM TAB

REAR NAVIGATION LIGHT

FLYING /  
ELEVATOR

PITOT TUBE

THRUST  
REVERSER

CU 610-6 GENERAL ELECTRIC  
3000-LBS.-THRUST TURBOJET ENGINES

FORWARD FUSELAGE FUEL TANKS

REAR FUSELAGE FUEL TANK

WING EXTENSION AND  
RETRACTION  
DRIVE UNIT

MODIFIED FOWLER  
DOUBLE-SLOTTED  
FLAPS

WATER-BASE  
CONTROL SYSTEM

AILERON TRIM TAB

WING EXTENSION  
AND RETRACTION  
SCREW JACKS

OUTBOARD WING  
BOX-BEAM-BOGIE  
ASSEMBLY

NAVIGATION LIGHTS

AILERON-CONTROL  
TORQUE TUBE

OUTBOARD EXTENDIBLE WING

Technical Art by Fred Wolff

booster engineer at the Kennedy Space Center. Willerton, a pilot for 20 years, has helped to rebuild everything from old Spad fighters to modern jets.

These three men set their sights on a darn-near impossible goal. They wanted to build a business jet that could cruise at better than 550 mph, fly easily at 30,000 feet and, on long trips, fly nonstop for more than 2250 miles (with a 30-minute reserve), and carry eight people and baggage in comfort.

There are already about a half-dozen business jets with that kind of performance. But Skyshark, its designers decided, must do the same job with 40 percent less fuel consumption, and had to be able to lift off and land in one-fourth the distance required in standard takeoffs and landings. That wasn't all. The plane had to be able to out-climb any other business jet and be far stronger structurally. And it had to be able to do all this while operating as an amphibian.

It takes something special to produce such superior performance. That "something" is a variable aspect ratio wing—another Dr. Gioia brainchild. It's literally a wing within a wing.

For normal takeoff and landing or

#### WATER DEFLECTION AREA



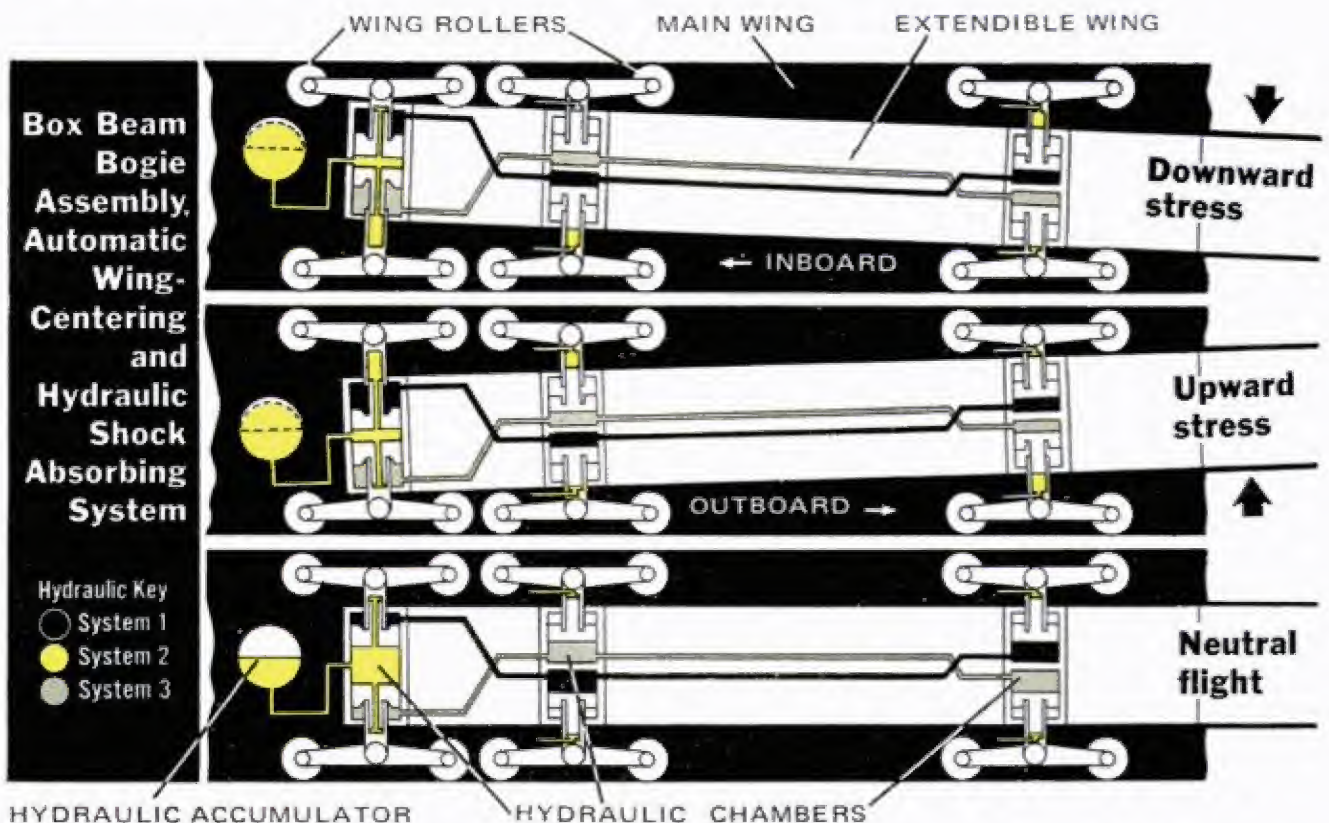
**PROBLEM OF WATER DOUSING** jet engines was met by making wings deep enough to provide protection

very slow flight, the wing is fully extended, increasing the span and greatly adding to the lift and control characteristics. For swift climb and rapid cruise with a minimum of drag, the wing retracts. Though the basic idea isn't new, the wing-control system developed by Dr. Gioia and his team is so new it's being patented. Not only does it allow for wing movement, it increases wing strength at the same time.

The key element in the system is a hydraulic mechanism that supports the inner (telescoping) wing. At the same time, the mechanism serves other critical functions such as absorbing shock, dispersing flight loads, damping flutter, increasing structural strength and improving flight characteristics.

The STOL (short takeoff and landing) capability would make thousands of small fields available to business and private pilots. STOL would also make

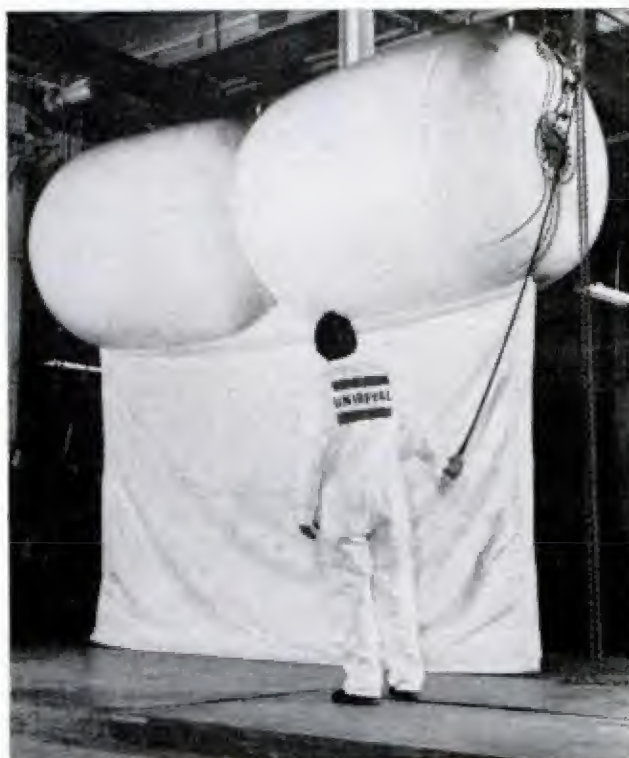
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## French castle in Florida

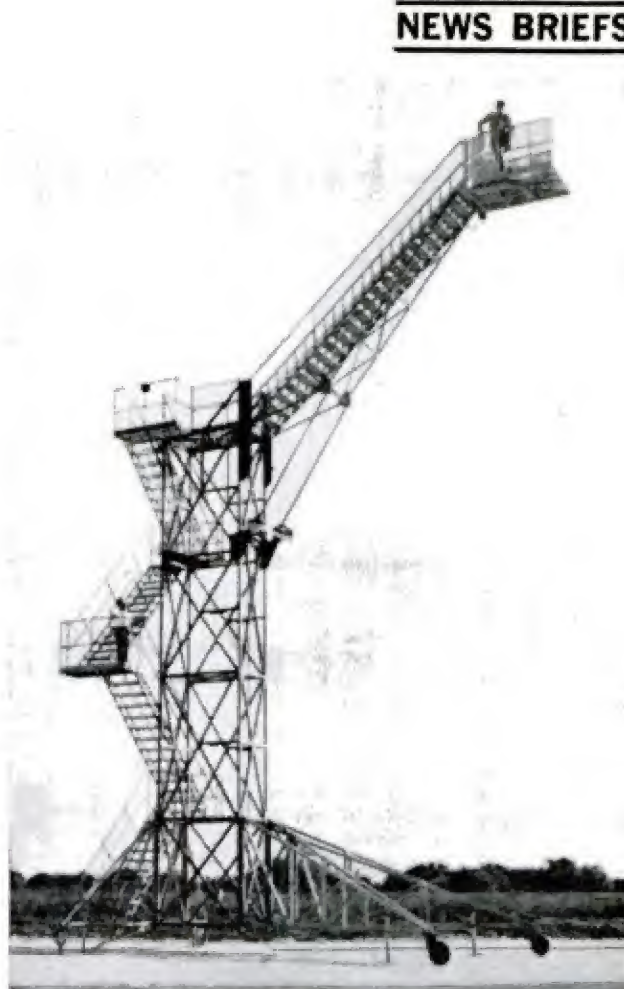
A replica of a 15th century French palace rises in central Florida at the center of the "Magic Kingdom" in Walt Disney World. The castle is 200 feet high. The Walt Disney World attraction will open in October.



## Oil-spill container

Designed to contain oil spills in 8-foot seas and 30-knot winds, Uniroyal's High Seas Oil Boom can be installed and anchored around a spill in 24 hours. Prototype section (shown) has 8-foot draft, 5-foot freeboard.

APRIL 1971



## Tall 'ladders' for tall planes

Maintenance workers who must get to a respectable altitude to service huge new jets are given an assist by the Aerosupport Div. of Federal Sign and Signal Corp. The work platform on the firm's access stand (top) swings from 19 feet up to 55 feet for servicing tail surfaces. Two independently operated platforms on the "people placer" stand (bottom) can support two 10-man crews. The platforms move up, down and sideways.

81

**PM OWNERS REPORT**  
**LINCOLN-MERCURY CAPRI**

A Nationwide Survey Based on  
3,000,000 Owner-Driven Miles



# Stylish, Economical Import Needs More Than 1600 cc

By MICHAEL LAMM, West Coast Auto Editor

**M**OST CAPRI OWNERS decided to buy the car because of the coupe's mini-Mustang styling. "Sexy," a Long Island technician calls it. A Rochester, N.Y., newspaperman says, "I like the European flavor. It's eye-catching. But I also like the car's ease of maintenance, good gas mileage, ride, handling and maneuverability."

Our questionnaires went out to Capri owners in November 1970, before this car was available with the two-liter overhead-cam engine. So everyone who answered was still driving the older 1600-cc version—the only one available at the time. That accounts for the high percentage of requests for a bigger engine and more power (See

"What Changes Would You Like?" in the summary chart).

The 2000-cc engine, available since January in most areas of the United States, adds only \$50.10 to the Capri's base price. It makes an automatic transmission available for the first time (\$184.70 extra), taking care of another common complaint from Capri 1600 owners. The 1600 comes only with a manual four-speed.

The Capri is sold in this country through Lincoln-Mercury dealers and comes in a single body style, the four-passenger coupe. Most European engine choices for the Capri are still not available in this country. For example, a Britisher can choose a 1300-cc ver-



sion (price, about \$1600) plus several larger four-cylinder models, or even a three-liter mini-muscle V6 that delivers 144 bhp and would certainly have a market here!

Before January 1971, all Capris arrived in this country with the 1600-cc pushrod Four (97.5 c.i.d., 75 bhp at 5000 rpm). This is the same engine that serves the basic Pinto. Now, though, as mentioned, you can order your Capri with the 2000-cc overhead-cam Four that puts out 100 bhp at 5600 rpm. It's again shared with the Pinto, so parts and service should be readily available.

The difference in gas mileage (1600 vs. the 2000) wasn't obtainable for this Owners Report but shouldn't be too great. The gain in performance, though, should more than offset the estimated 2-4-mpg difference, especially since over 50 percent of our respondents complained of lack of power. Only 5.1 percent, in contrast, felt they weren't getting enough miles per gallon.

Economy of operation ranked right behind styling as the Capri owners' main reason for buying, and it ran an even closer second under "Specific Likes." Economy in this case means more than just good gas mileage. To a Maryland computer operator, economy means, "I had to buy a four-cylinder car in order to get a reasonable insurance rate." And to a medical-school administrator: "I couldn't believe it cost only \$2300 for the quality." To an Ohio metallurgist: "I got good, low-cost, everyday transportation in a good-looking, sporty package."

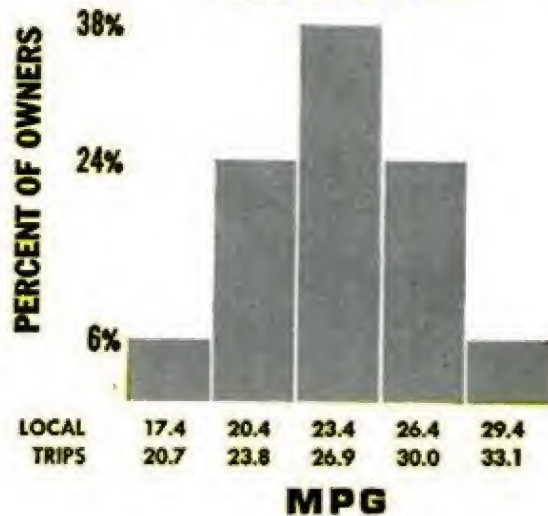
Quite a few owners mentioned a



**CAPRI 1600 ENGINE**, same used in the Pinto, is a bit small for some owners. Two-liter is now available

### CAPRI FUEL MILEAGE CHART

1600 cc (97.6 cu. in.) Four



**CAPRI WAS STYLED** originally for the British market as a compact four-seater with Mustang charisma. That's part of its success in Europe and here since more owners bought cars for style than other reasons





**CAPRI HANDLING** is enhanced by radial tires which are standard equipment along with front disc brakes

parts and repair problem, however. Almost half had experienced mechanical troubles of some sort, and of those, more than half claimed their dealers hadn't repaired the defect properly. Said a St. Louis bank collector: "After waiting three weeks for one screw for the carburetor, I installed it in 10 minutes. The dieseling was never corrected by the dealer, but my service station mechanic did it." A self-employed Bay Stater: "Dealer would not repair half a dozen difficulties. My 6000-mile checkup consisted of an oil change. So I wrote to Ford Publications for a shop manual, now use a local repairman."

Workmanship opinions varied a great deal. We noticed that people who pre-

**REAR SEATS** are shaped buckets. Rear leg, headroom are good for size of car, drew only few complaints



viously had owned VWs found more fault than the rest with the way Capris are put together. A Charlotte, N.C., TV cameraman: "I'd like to see their quality control come up to VW. Workmanship on the inside is a little slack." An Oregon student: "Not as well put together as an expensive U.S. car but much better than a medium or low-priced U.S. car." And, "Mine must have been put together during a long series of coffee breaks." Or, "Better than the Pontiac I'm driving."

About comfort, these remarks: "I'm a traveling salesman and spend every day in my Capri. Seats in front are very comfortable. The back isn't a Mark III, but it's better equipped for comfort than MG, Triumph, Jag, Volks, etc." "Love those reclining front seats." "Back seat better than Mustang or Javelin." "Rear passengers have to have a very high pain threshold."

Owners seem to agree that the Capri handles extremely well, not only in tight parking maneuvers but on hard cornering and on the open highway. The Capri isn't much affected by crosswinds, and several owners said they notice a definite lack of wind noise.

Under "Specific Complaints": "Rough on bumps; hard to warm up when cold." "Not enough power." (over and over again.) "Paint ripply and thin." "En-

**INSTRUMENTS, CONTROLS** are well placed. Automatic transmission is now option with two-liter engine



## Summary of 1970 Capri Owners Reports\*

Total miles driven.....2,985,544

**Average miles per gallon:**

97.5-cu.-in. 4 (1599 cc)  
 local driving ..23.4  
 long trips ....26.9  
 (2-liter engine not available at  
 time of survey)

**Why did you choose this car?**

Styling .....71.9%  
 Economy .....49.1  
 Price .....19.5  
 Size .....13.0  
 Handling .....11.5  
 Comfort .....4.4

**Specific likes:**

Style .....69.5%  
 Economy .....66.9  
 Handling .....61.2  
 Comfort .....34.0  
 Size .....11.2  
 Workmanship .....11.2  
 Ride .....10.7  
 Brakes .....10.7

**Specific dislikes:**

Lack of power .....17.6%  
 Dealer service .....17.6  
 Brakes .....8.4

Poor workmanship .....7.5  
 Bouncy ride .....5.4  
 Poor materials .....5.4  
 Low gas mileage .....5.1  
 Rattles .....5.1

**What changes would you like?**

Bigger engine .....30.2%  
 More power .....20.9  
 Better materials .....7.1  
 Bigger trunk .....4.5  
 More complete dash .....4.5  
 Glovebox .....4.2

**Had any mechanical trouble?**

No .....51.3%  
 Yes .....48.7

**What kind of trouble?**

Carburetion .....18.5%  
 Electrical .....14.6  
 Oil leakages .....14.6  
 Ignition .....8.0  
 Choke .....4.6  
 Gas line blockage .....4.6

**Did you repair it yourself?**

No .....91.4%  
 Yes .....8.6

**Dealer repairs satisfactory?**

No .....51.6%

Yes .....48.4

**Is this your only car?**

No .....62.6%  
 Yes .....37.4

**Number of cars owned:**

Capri only .....37.4%  
 2 cars .....43.2  
 3 cars .....14.4  
 4 cars .....4.7  
 5 or more .....0.3

**Makes of other cars owned:**

Chevrolet .....20.2%  
 Mercury .....16.4  
 Ford .....15.0  
 Pontiac .....10.3  
 Volkswagen .....10.3  
 Buick .....9.9  
 Oldsmobile .....7.0

**Age distribution of owners:**

15-29 years .....54.7%  
 30-49 years .....36.1  
 50-plus .....9.3

**Would you buy another Capri?**

Yes .....75.2%  
 No .....24.8

\*Percentages might not equal 100% due to rounding and/or insufficient data.

gine keeps running on." "I only wish the dealer was half as good as the car!" "Seatback release seems very poorly placed." "Wish they'd given me a glovebox instead of that shelf." "Dashboard buttons are unlit and easily confused. Also could use more gauges and less warning lights."

Relatively few owners commented on the standard front disc brakes. Several mentioned that they squeak. One driver did say though, that, "... the

**TRUNK SIZE**, good for size of car, could be bigger for some owners who would sacrifice rear-seat space



Capri's braking system is the best I've ever experienced."

Under "Specific Likes": "Handles like a dream." "The Capri is the nicest handling car . . ." "workmanship throughout is terrific. Mileage good. A real ball to drive on the highway." "I like everything about it—styling, radial tires, flow-through vent, brakes, rack-and-pinion steering, solid feel."

Running quickly through common what-I'd-like-to-see-changed: "Enough power for airconditioning." "Better ventilation." "Windows keep fogging. Between that, the position of rear-view mirror, high seatbacks, and big blind places beside rear window, it's hard to see out of." "Relocate the radio speaker." "Light ashtray." "Eliminate the engine 'buzz point' at 58 mph. I hear they all buzz at that speed."

A young Pennsylvania typist writes, "For me, it's perfect. When I get married and have a family, I'd prefer a larger car, but the Capri will still be ideal for a second car."

And a California mechanic concludes: "I have talked to my friends about this car, and four of them have also brought Capris. I think it's the best of all cars in its class." ★★★



### **British Army's mine planter**

In much the same fashion as a seed planter operates, a British Army mine layer digs a furrow, inserts rectangular, pressure-sensitive mines and covers them with dirt. The vehicle is towed at 6 mph for the job.



### **Terra Jet sports vehicle**

The Terra Jet is a new four-wheel-drive, all-terrain vehicle that'll do 50 mph on land and 7 mph in water. It's driven by a 28-hp, two-cylinder Kohler engine. Maker is Terra Jet, Inc., Drummondville, Que.



### **Mixer for small jobs**

Developed for use on small jobs or hard-to-reach sites, the new Micro Mixer can economically deliver batches of concrete that would be impractical to carry in a larger unit. The small mixer has a capacity of three yards and can be mounted on a truck or platform. Manufacturer is Conequip Div., Udyco Industries, Novato, Calif.



### **Bathroom with a view**

One of the most unusual public baths in the world is at Wakayama, Japan, where visitors can take a 15-minute aerial tramcar ride and admire the scenic view while sitting in a tub of hot water. Passengers enter wearing bathrobes, which they slip off in the car. Two rules: No one can stand up to admire the view unless robed, and no mixed bathing.



### Ariel 3 stays firmly planted on the ground

Three lady riders demonstrate the new Ariel 3, a three-wheeler built by BSA/Triumph Motor Cycle Div. Powered by a 50-cc, two-stroke engine, the little runabout features a "Tri-Torque" suspension that keeps the two rear wheels on the ground when cornering.



### Giant pillow has youngsters walking on air

Youngsters can bounce to their hearts' content inside the giant Space Pillow, an air-inflated building with a three-foot-deep air pillow as a floor. The amusement is built by Scott & Co.; the structure shown is at Marineland of the Pacific.

### Polar Beetle

The ubiquitous Volkswagen Beetle—which seems to thrive almost anywhere in the world—can now be found as far south as Antarctica. Of course, it needed a few modifications, such as skis in front and cleated wheels in the rear, to negotiate the terrain. The car was taken to the South Polar continent by the South African Department of Transport.



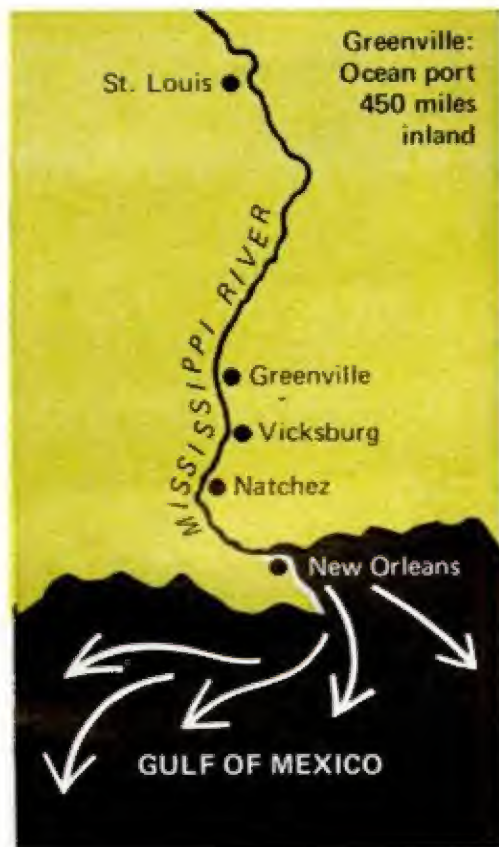
# Mini-Ships Bring the Ocean to Mid-America



**FIRST OF A FLEET** of 10 Mini Ships, the *Mini Lark* reveals her shallow draft as she makes port on the Mississippi. Map shows how the Minis will link inland ports to Caribbean. Service will expand to St. Louis, Birmingham, Tulsa and Little Rock

**A new kind of freighter designed to travel both the high seas and the low water of the Mississippi will soon provide a door-to-door service 'wherever there's a trickle of water.'**

*Photos by Dan Guravich*



**A 215-FOOT FREIGHTER** that can navigate in as little as four feet of water and weather the rough seas of the open ocean has made Greenville, Miss., 450 miles from the Gulf of Mexico, the country's newest seaport.

The Mini Ship is the brainchild of George Livanos, president of Seres Shipping, Inc., a Greek line. Two ships have already been built in Japan to be followed by at least 10 others for the Mini Line. By providing direct ocean shipment hundreds of miles closer to the great industrial areas of the Midwest, the mini carriers will make possible substantial savings on inland freight. They may also make it tough on U.S.-owned barge lines now plying the Mississippi. Greenville will soon have a terminal capable of handling four Mini Ships simultaneously and will become a trans-shipping and freight forwarding center with barge, truck and rail lines.

An oceangoing ship that could operate economically on the Mississippi had to be large



enough to carry sufficient cargo, yet have sufficient clearance to get under bridges at high water. It also had to have a shallow keel to travel the river during low-water seasons. Because the Mini Ship can do this, it is being watched with interest by many countries.

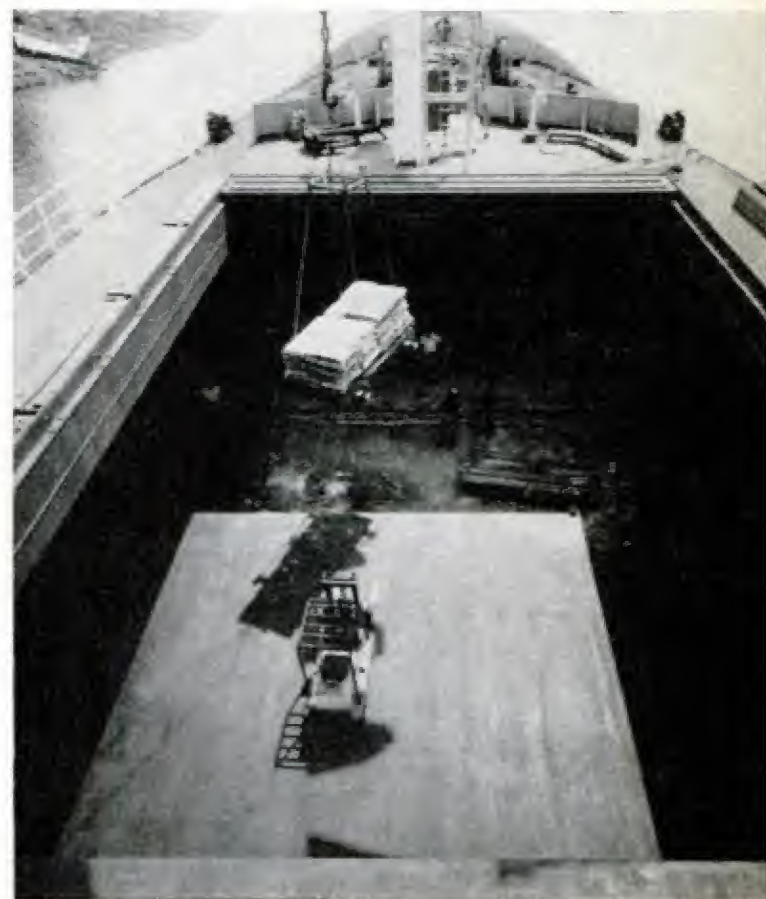
Each Mini Ship has a capacity of 3100 tons—the equivalent of over 150 truck loads, of 60 rail cars or over five barge loads. The \$500,000 vessels have recessed engines so that tail shafts and rudders may be repaired or replaced without drydocking.

At present two Mini Ships make twice-a-month runs from Greenville to ports in the Caribbean area. When the Greenville Terminal is completed, 10 mini carriers will operate on regular schedules between Greenville and Central America. The Mini system will also allow large ocean vessels to discharge their cargoes at convenient points where the Mini Ships will pick them up and deliver them to inland ports. As George Livanos puts it: "It will be door-to-door service wherever there is a trickle of water." ★ ★ ★

APRIL 1971



**CONTAINERIZED CARGO** is swung aboard Mini Ship at Greenville by eight-ton electrohydraulic crane. Mini Ships will soon rendezvous with large ocean vessels in the Caribbean to pick up and discharge loads. This will open the Greenville area and other sea-river ports to cargo to and from world ports



# Now: Big, Quiet Buses For the Airplanes



LOCKHEED'S L-1011 TRISTAR is a wide-body jetliner powered by three Rolls-Royce turbofan engines

The first 'small' versions of the airbus will seat only 300 passengers. But inside they're quiet, comfortable—and a great place to eat

By JOHN C. GOODRUM

**T**HE LONG WAIT for the airbus—the huge, high-speed jet hauling 300 or more passengers comfortably on both short and medium-range flights and operating from close-in, satellite airports—is at an end.

The roll-out of the McDonnell Douglas DC-10 last July and of the L-1011 TriStar at Lockheed's spanking new Palmdale, Calif., plant two months

TRISTAR FIRST-CLASS INTERIOR has seats arranged in pairs, eight-foot ceilings, large windows, two aisles







**DC-10 TRI-JET** is powered by three General Electric CF6-6 engines. Like L-1011, it is medium-range plane

later marks the beginning of the airbus era. This means greatly increased comfort, convenience and service for the passenger. It also means reduced airport noise and less air pollution.

Designed to haul nearly three times the number of passengers currently being transported in conventional jets, the two competing entries on the commercial air transportation scene will operate economically on flights as short as from Louisville to Atlanta or as long as from Miami to Seattle. And regardless of the length of the flight, the wide-bodied design guarantees that the passenger will enjoy his flight more.

By any standard, both airbus entries are enormous.

Imagine an airplane parked on a football field with its nose at one goal line. Its tail would extend to the opposite forty-yard line and would tower over the top row of seats in almost any stadium. Its wing tips would extend to just inside the sidelines. This is the airbus.

Both the DC-10 and the L-1011 are

remarkably similar in almost every physical dimension.

The DC-10 is 181 feet long with a wingspan of 155 feet, 4 inches. It has a maximum takeoff weight of 410,000 pounds. Powered by three General Electric CF6-6 engines, its range is 3670 nautical miles.

The Lockheed TriStar is 178 feet long

**DC-10 INTERIOR** is 18 feet 9 inches wide. Plane holds 270 passengers, 345 if all-economy seating

PHOTO BY HENRY ARTOFF





PHOTO BY HENRY ARTOFF

**FLIGHT DECK** of DC-10 has been simplified with instruments grouped for maximum efficiency. Cockpit provides for pilot, copilot, engineer, two observers



**BELOW-DECKS GALLEY** sends carts up to kitchen by elevator on L-1011 (above). Carry-on luggage (below) can be stored in closed overhead compartments



and has a wingspan of 156 feet, 4 inches. Its takeoff weight is 409,000 pounds. It is powered by three Rolls-Royce RB 211-22 powerplants and has a range of 3500 nautical miles.

Each engine generates in excess of 40,000 pounds of thrust. On both aircraft, two of the engines are mounted conventionally on pylons beneath the wings. The third is installed above the fuselage at the base of the vertical stabilizer. The difference is that on the DC-10 there is a straight-through type air duct for the center engine; on the L-1011 the center engine exhausts through an S-shaped duct.

Landing-gear geometry permits the airbus to operate from existing medium-size airports. Main gear lateral spacing and the spacing of individual wheels produce lower stresses on runways and taxiways than those imposed by the current jet-liners. And even though the airbus is considerably larger, no maneuvering difficulties are anticipated.

Each airbus engine produces more than twice the takeoff thrust of those on first-generation jets. But startling improvements on the new high-bypass-ratio turbofan powerplants significantly lower noise levels. Special acoustical treatment of engine inlet and exhaust ducts, coupled with improvements in the engine itself—the elimination of inlet guide vanes ahead of the fan and reduction of fan tip speed on the Rolls-Royce engine, for example—further cut down on noise.

Travelers accustomed to today's jets will find the airbus surprisingly quiet. Acoustical treatment in the fuselage and interior elements of the aircraft also cut down the amount of noise appreciably.

The traveler's real surprise comes when he first views the interior of the airbus, for its huge size is not apparent until then. Then, suddenly, he is struck by the fact that the airbus comes with built-in comfort.

Even in the all-economy class version (maximum capacity), there are

**McDONNELL DOUGLAS AND LOCKHEED  
SPECIFICATIONS COMPARED**

	<b>DC-10</b>	<b>L-1011</b>
<b>Length</b>	<b>181' 5"</b>	<b>178' 6"</b>
<b>Fuselage diameter</b>	<b>19' 9"</b>	<b>19' 9"</b>
<b>Wingspan</b>	<b>155' 4"</b>	<b>156' 4"</b>
<b>Max. height</b>	<b>58' 1"</b>	<b>55' 4"</b>
<b>Ldg. gear base lgth.</b>	<b>72' 4"</b>	<b>70'</b>
<b>Ldg. gear track</b>	<b>35'</b>	<b>36'</b>
<b>20/80 pass. load</b>	<b>270</b>	<b>256</b>
<b>High-density pass. load</b>	<b>345</b>	<b>345</b>
<b>Range (naut. miles)</b>	<b>3670</b>	<b>3500</b>
<b>Max. takeoff wt. (lbs.)</b>	<b>410,000</b>	<b>409,000</b>
<b>Fuel Capacity (lbs.)</b>	<b>147,000</b>	<b>156,000</b>

less than 40 of the uncomfortable "middle" seats in the customary three-abreast arrangement. Even these are wider and much more comfortable than those on today's conventional jets. Otherwise, seats are arranged in pairs, and there are two wide aisles. This, coupled with the eight-foot ceiling height, large windows polarized for light control and well-balanced lighting, give the passenger a feeling of spaciousness. The feeling is enhanced through the use of overhead storage, eliminating the clutter so often experienced today. Dividers separate the aircraft into "rooms" to achieve an atmosphere of intimacy.

The huge fuselage makes possible improved food service. Quick-frozen food is prepared during flight in high-speed ovens in a below-deck galley. Three hundred meals can be prepared in less than an hour and transported to the passenger deck by elevators. Specially designed serving carts keep the food hot until it is served. The system provides more room for passengers and also results in faster galley service at each stop.

New advancements in airconditioning and cabin pressurization further pamper the passenger. There are separate automatic temperature controls for each cabin section. Separate airconditioning systems keep individual compartment temperatures at comfortable

levels and serve as backup systems for each other. Fresh air is circulated through each compartment.

The flight crew also enjoys increased comfort and convenience, which in turn results in higher safety. There is a crew of three: pilot, copilot and flight engineer. And there is space for two observers.

Developed through the use of full-size mock-ups by human factors engineers working closely with flight crews, the flight decks are simplified and highly efficient.

Both the DC-10 and the L-1011 have been designed for operation on a quick turnaround basis and maximum time in the air.

Minimum ground servicing equipment is required, reducing clutter around the parked aircraft. However, their design is such that virtually all operations are carried on at the same time that passenger loading takes place. This results in a substantial reduction in servicing time over that required by current jets only half the size of the airbus.

In addition, maintenance times have been slashed. The ready accessibility of components, modular design, quick-attach component mounting, rapid detection of problems and maximum interchangeability of parts all cut the time required for maintenance and improve aircraft availability.

Both McDonnell Douglas and Lockheed plan extended-range, higher-capacity versions of the airbus. These planes will have larger wing areas, possibly stretched fuselages and engines in the 50,000-pound-thrust class. For the immediate future, however, passengers will have to be content with the "smaller" versions seating only 300 or so comfortably cared for passengers. Operating from today's airports, the airbuses will help relieve airport congestion at the parking ramp and materially improve air travel convenience and comfort.

The airbus is here. It is both needed and welcomed.

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# Those 'Little' 4-Cylinder Engines— Can You Have Durability and Performance?

Here's all you should know about the rapidly increasing numbers of small-displacement, but very capable, engines—especially since there may be a Four in your future!

**FOUR-CYLINDER POWERPLANT** in the Fiat 124 Spider has a twin-overhead-cam design with a displacement of 1608 cc (98 cu. in.) and puts out 104 hp at 6000 rpm

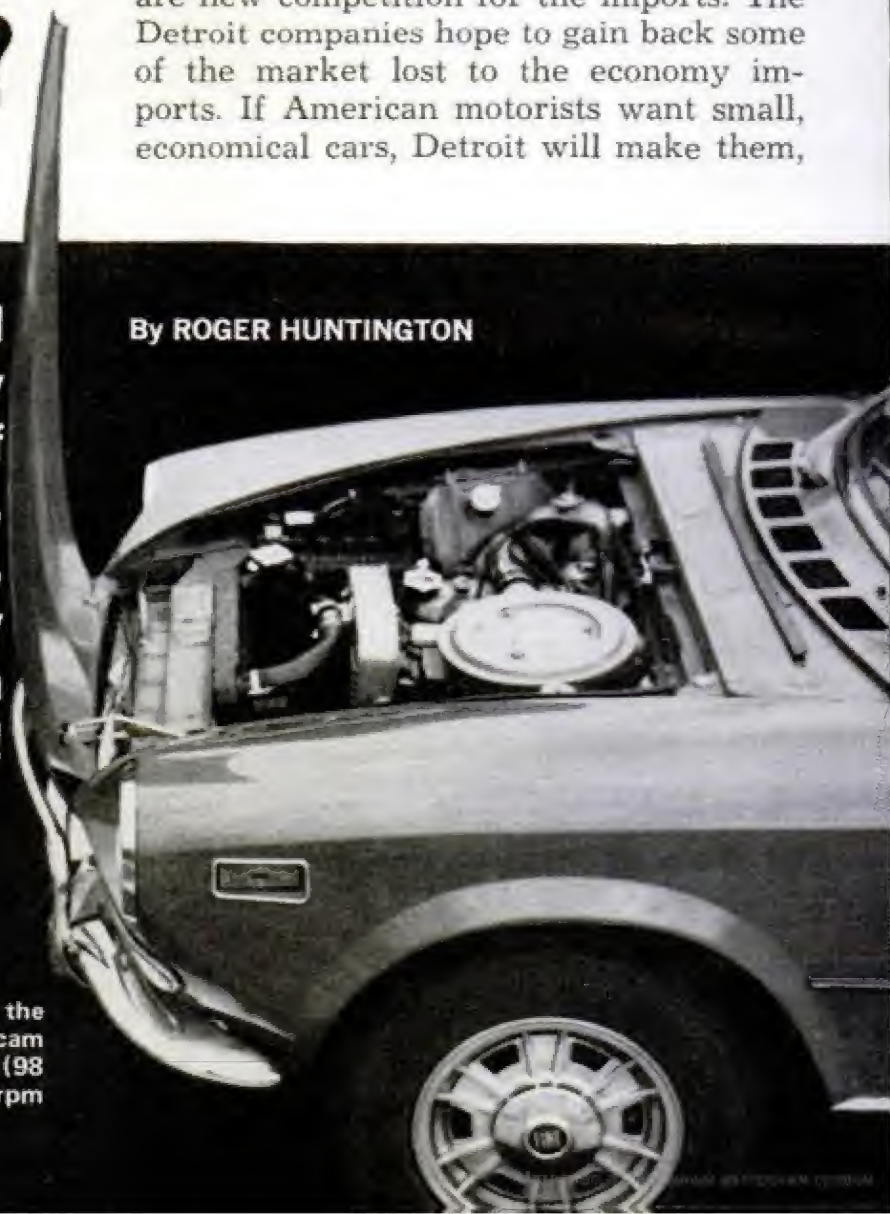
**A**MERICAN PASSENGER CARS have always had the biggest-cubic-inch engines in the world. If you're under 35, chances are your driving career was born and weaned on an engine over 300 cu. in.

If you're a young performance enthusiast today you may be used to 400 cubes or more.

But all that is changing: American car buyers are going to be increasingly faced with a choice between large and small engines in the future. Imported cars, most of which have engines between 60 and 120 cu. in. (1 to 2 liters), made up 15.3 percent of the market in '70. That's a lot of cars. Foreign cars have traditionally had small engines because license fees overseas are usually based on engine size rather than car weight. Also, gasoline costs two or three times as much in most parts of the world as in America—so fuel economy is vital.

The Chevrolet Vega and Ford Pinto with engines in the range of 100 to 140 cu. in., are new competition for the imports. The Detroit companies hope to gain back some of the market lost to the economy imports. If American motorists want small, economical cars, Detroit will make them,

By **ROGER HUNTINGTON**



and so, increasingly, motorists will face a choice between large and small engines in the future.

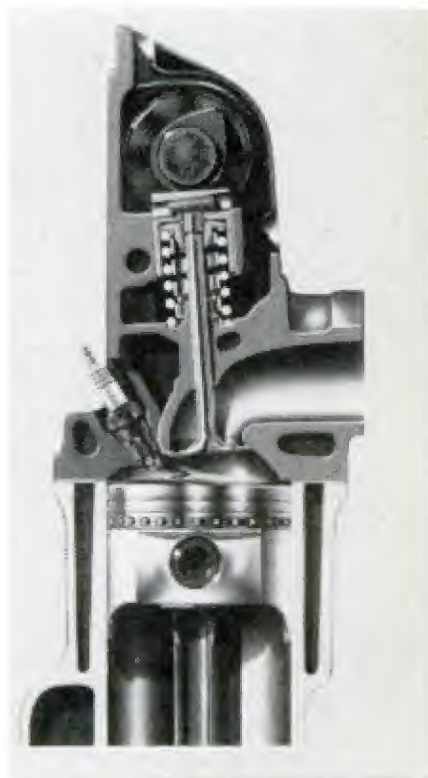
What's the relationship between size and fuel economy? Between size and horsepower and torque? How does size affect the rate of wear and life of the engine? Are small engines "worked to death" on American streets and highways?

The relationship between size and performance, horsepower and torque, is pretty cut and dried. There's no way a small engine can be as strong as a big engine, if both have equal "tuning" refinements—like carburetion, compression ratio, cam timing, exhaust restriction and so on. However it's much easier to get more horsepower per cubic inch and per pound of weight with a small engine. This is because there's less friction in a small engine, and you can get more valve breathing area in relation to the size of the cylinder. These are simple physical facts you can't get around. Many small foreign engines develop one horsepower for each cubic inch of displacement with no fuss or muss—whereas a big Ameri-

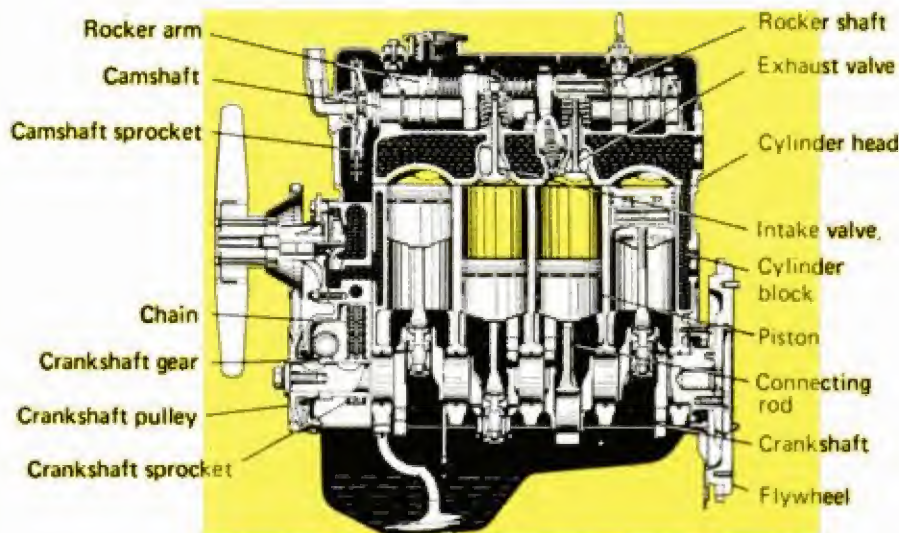
can V8 has to be tuned right up to the peak to do it. And then it's so rough and temperamental that it's no pleasure to drive on the street.

The worst thing about small-engine performance is lack of midrange *torque*—or the twisting effort that the engine imparts to the flywheel. You get more torque from larger-displacement engines. For example, compare the tiny 791-cc Japanese Honda with the 1600-cc Volkswagen, which has twice the displacement: The Honda has a peak power output of 70 hp at 8000 rpm, compared with 65 hp at 4600 rpm for the VW. The Honda should show quicker acceleration through the gears, assuming equal car weight. But look at the torque: The Honda gives only 49 ft.-lbs. at 6000 rpm, compared with 87 at 2800 rpm for the VW. The bigger VW engine gives less hp, but almost twice the torque. Obviously the VW engine would be more peppy and responsive at normal speeds on the street.

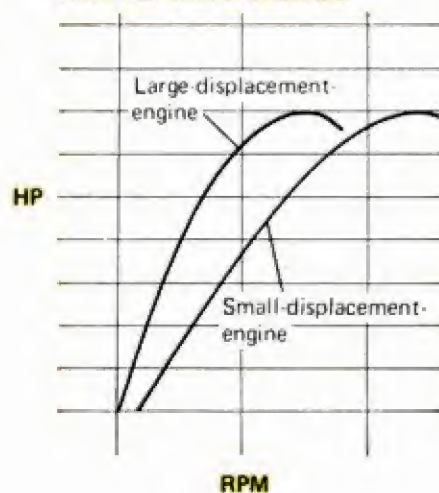
So this brings up an important truth that you must get used to about small engines: They give poor torque at low and medium speeds, so you have to



**DOMESTIC FOURS** include 2300-cc, aluminum-block (left) Vega engine. With overhead camshaft design (right), engine is available at 90 hp with single-barrel carb, or at 110 hp with double-barrel configuration



### ENGINE POWER CURVES



**DODGE COLT ENGINE**, a 1600-cc overhead cammer from Mitsubishi, develops 100 hp at 6000 rpm, more than one hp per cu.in. Curves show how small engine gives same hp as big one, but necessarily at higher rpm

shift gears and *keep the revs up* to get the most out of the engine. If you don't like to shift gears you may not be happy with a small engine. Of course the more popular imports now offer optional automatic transmissions which supposedly do the shifting for you. But you still have to tip into the throttle harder, and downshift more, to get the performance a big American engine gives without even breathing hard.

On the matter of fuel economy there's no argument. The smaller the engine the better the economy. But the difference is not necessarily in straight-line proportion to size. You run into the familiar law of diminishing returns as you go down in displacement. An American six-cylinder car of around 4500 cc (274 cu. in.) might give an average tank mileage of 18 or even 20 mpg. A 1500-cc import engine, one-third the size, might give 10 mpg more. And then going down to half this size, 750 cc, might add only another 5 to 8 mpg.

The reason for this is a complex relationship between factors like engine friction, carburetor calibration, gearing, wind resistance on the car body (which doesn't decrease in proportion to engine size) and friction in the car's transmission and drive line. You've got just about everything working against you as you go down in engine size. You end up sacrificing a tremendous amount

of pep and performance to get a small improvement in fuel economy. This might be okay where gas costs a dollar or more a gallon. But is it here in America? The big advantage of a very small car over here—like, say, an 850-cc Fiat—would be in traffic maneuverability, more than fuel economy.

In recent years Detroit has been taking unique advantage of big-inch engines to get a much better compromise between performance and fuel economy. What they're doing is using extremely low rear-axle gear ratios to slow the engines 'way down in relation to car speed. Ratios like 2.56-to-1, 2.73, 2.80, 2.93—even for the small six-cylinder engines. The engines are just loafing at normal city and highway speeds. Engine friction is 'way down, and this increases the miles per gallon. In the old days, with gear ratios between 3.2 and 3.8-to-1, it took as much power to overcome engine friction at 30 or 40 mph as it did to pull the whole car! This took that much more gas. Of course these very low gear ratios really need an automatic transmission, where you get additional "torque multiplication" for acceleration by just pressing your foot down harder. But with automatics going on about 80 percent of all American cars now, this is no big problem anymore.

This unique gear-ratio-transmission

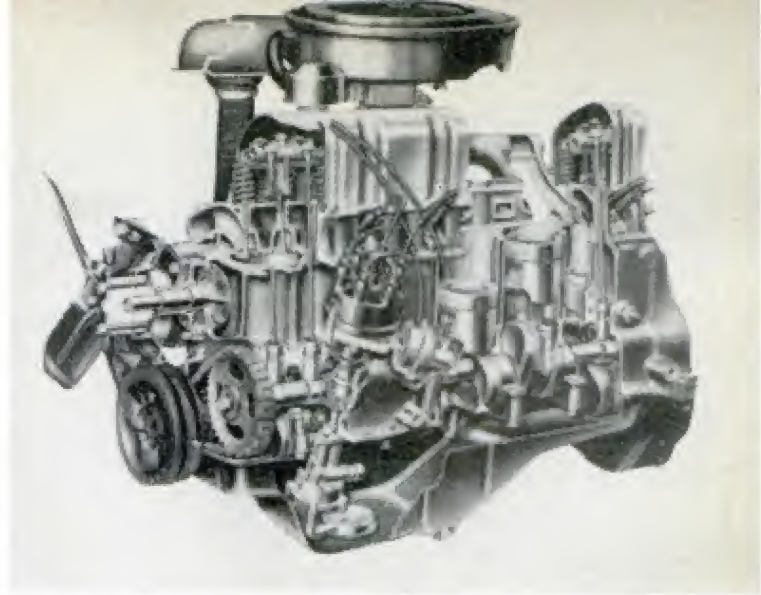
relationship is so far pretty much a Detroit trick. The imports have been frustrated because of low torque (part of it eaten up by a fluid torque converter transmission) and the fact that automatics are only now becoming a popular enough option to gear the cars for them.

How about engine wear? The small engine is definitely on the short end of this stick. It's got to be. It's a matter of how hard the engine is "working" at normal driving speeds, and at normal rates of acceleration in traffic. The small engine is simply working a lot harder. It's got to be geared to turn faster at a given car speed to give peppy response, and the driver has to wind it up tighter in the gears to get "big-car" acceleration to keep up with traffic. If you've ever driven a small car you'll know what I mean. And it's not just a matter of revs. You need to use a lot more throttle opening on the small engine. You've got to *pull* harder. This means much higher pressures and temperatures in the cylinder. A big engine is just loafing, at low speeds and loads, under the same conditions. The result is faster wear of cylinder bores and rings, bearings, and faster erosion of the valve-sealing surfaces on the small engine. Still, the useful life of small engines has been greatly extended in the last few years.

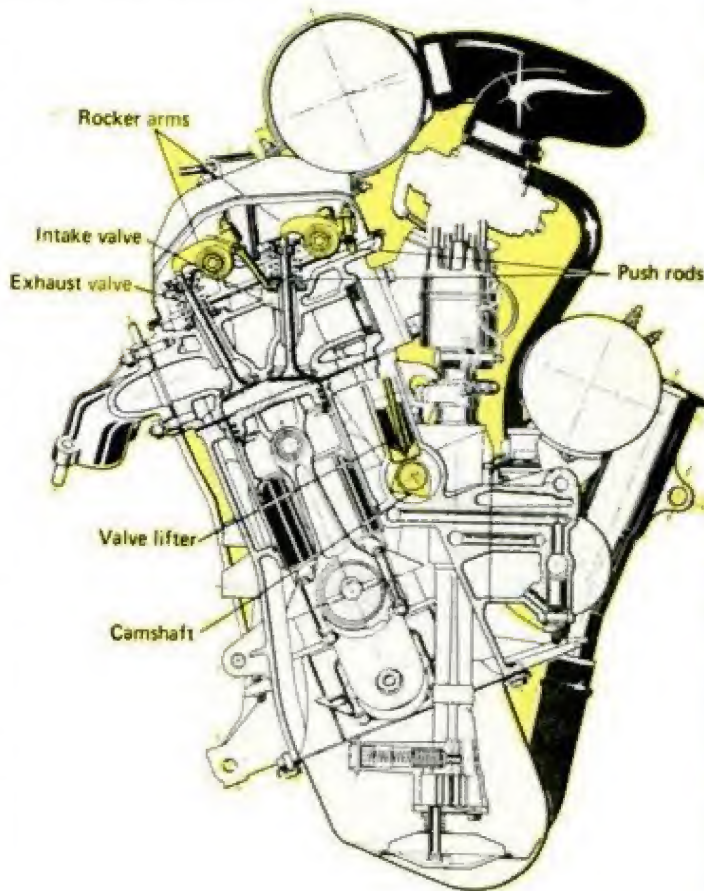
The overseas makers copied the "long-life" tricks of Detroit when they saw their engines could not stand up under the more strenuous American traffic conditions. There have been several significant changes. One is, simply, that the foreign engines are gradually getting bigger just like American engines. They're stronger in both power and torque, so they needn't work quite as hard to produce a given performance level. Since the early 1960s the bread-and-butter Volkswagen engine has grown from 1200 cc and 40 hp to 1600 cc and 65 hp, with new twin-port cylin-

*(Please turn to page 180)*

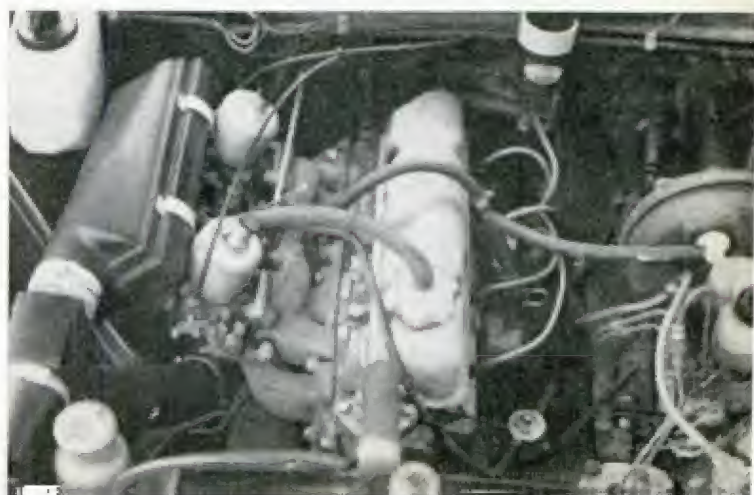
**VOLVO B18 FOUR**, shown here in '68 145 wagon, has evolved into B20 2-liter used in current models  
 APRIL 1971 97



**PUSHROD FOUR-CYLINDER** displacing 1600 cc powers Ford Pinto. Conservative design develops 75 hp



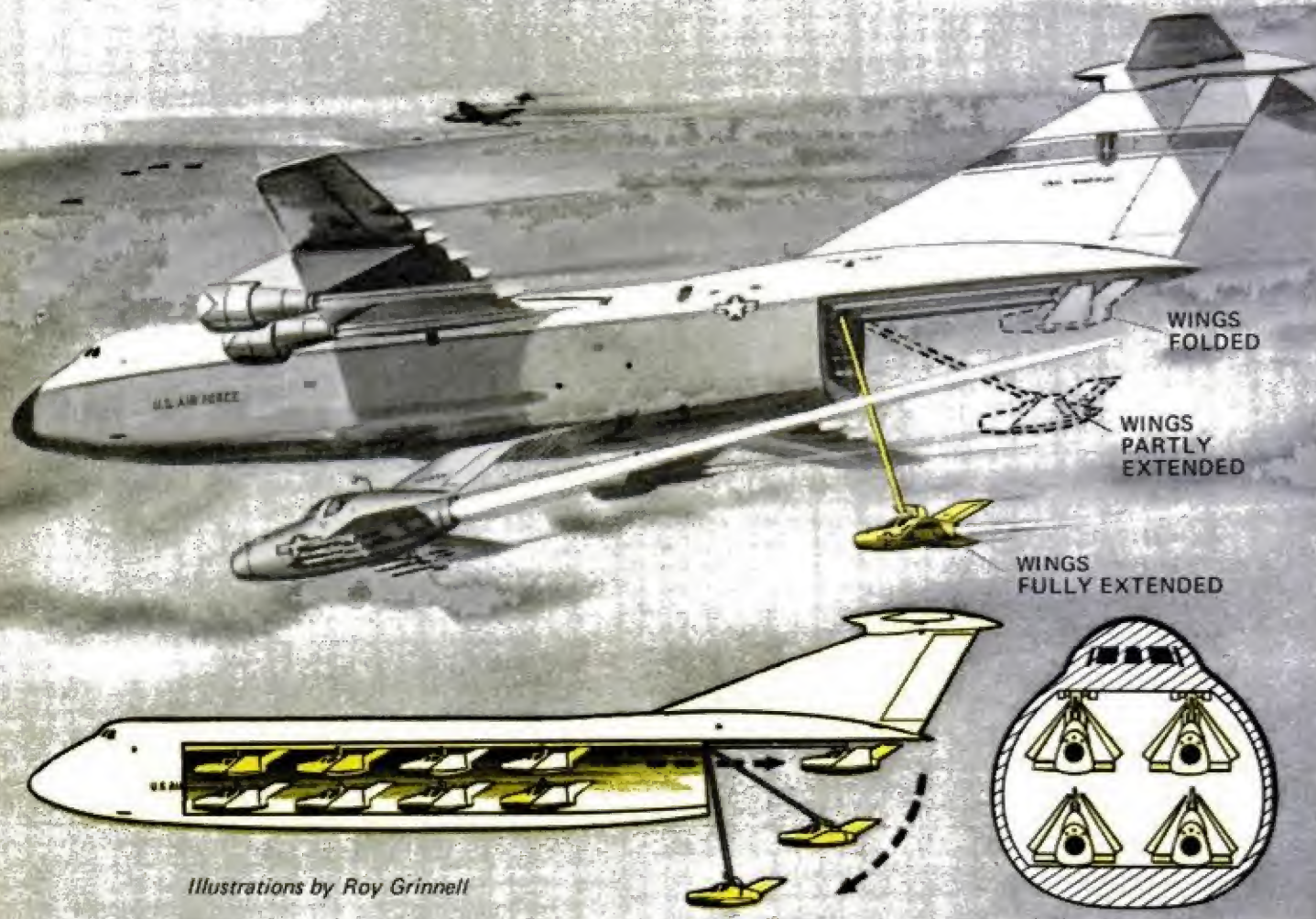
**PEUGEOT 404 ENGINE** with camshaft mounted high in side of block is tilted to allow lower engine hood



# Just patented

PM'S PICK OF THE NEW INVENTIONS

Prepared in cooperation with Roger S. Shashoua, Director, International Inventors Assn., Inc.



Illustrations by Roy Grinnell

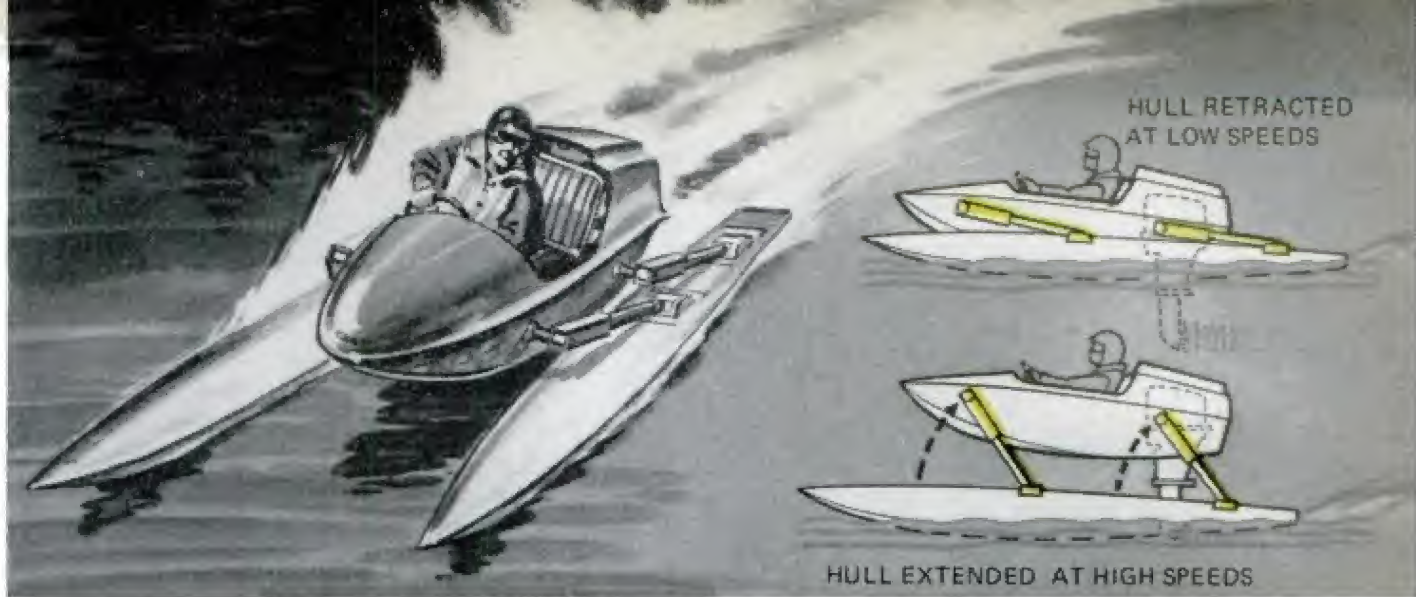
**1. FLYING "FLATTOP"** can launch fighter planes or small bombers at a moment's notice. The planes, with wings folded, are held in overhead tracks inside the huge cargo compartment. One by one, they slide along the tracks onto a pivoted boom at the tail. The boom swings down, carrying each plane below the mother ship. The wings unfold, the boom

hook is released and the plane flies off under its own power. The flying carrier could get the planes where they're needed much faster than conventional oceangoing aircraft carriers and would be less vulnerable to enemy attack. Returning planes could be picked up by the mother ship through techniques similar to those in use today in midair refueling



**2. EMERGENCY POP-UP FLARE** can be released the instant you pull to the side of a road, indicating to passing motorists that your car is disabled. An ordinary road flare is held in the end of a long spring-loaded mast. In its stored position, the mast lies flat along the rear bumper. When you press a button on the dashboard, it heats up a small coil pressed against the end of the flare like a cigaret lighter. This ignites the flare and the heat releases a bimetallic catch, allowing the mast to spring upward into a vertical position to warn other cars of the roadside danger

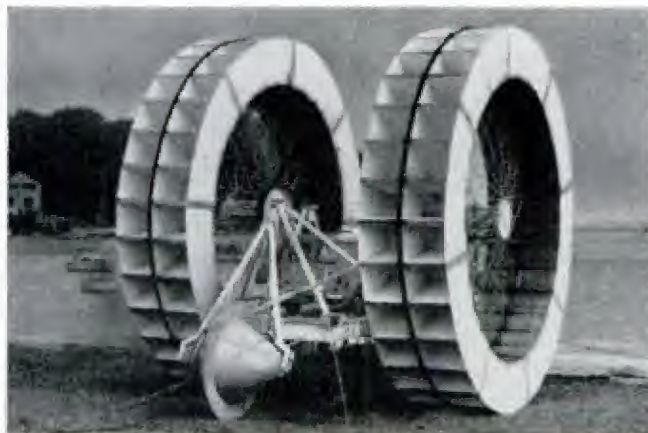
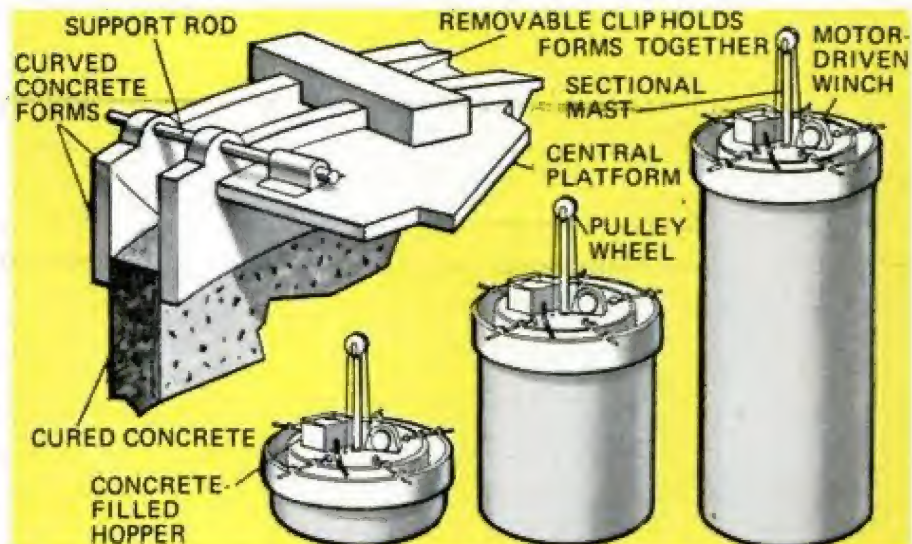




**3. YOU BANK AUTOMATICALLY** in this novel catamaran speedboat, enabling you to take fast turns safely and comfortably. The cockpit part of the hull is mounted independently of the pontoons on pivoted struts. As the steering wheel is turned, the struts on one side retract and those on the op-

posite side extend. This tilts the cockpit in the direction of the turn—the sharper the turn, the steeper the bank. The idea is to permit racing boats to use catamaran hulls, which typically offer low drag and good stability but poor banking. For added lift at low speeds, hull retracts into the water

**4: BUILDINGS SEEM TO GROW** by themselves in this system for speeding the construction of silos and other circular structures. A central platform is raised on a mast as the wall is cast one ring at a time. Curved plates attached to the platform are clamped around the top of the wall to provide forms for pouring in concrete. When the concrete has set, the forms are released and the platform is hoisted to the next level for pouring another ring



**5. ROLLING OVER LAND OR WATER** with equal ease, this modern paddle-wheeler can go anywhere. The two large segmented drums propel it in water and also give it good traction in mud, sand or rocky ground. Because of their size, they ride easily over ob-

structions and can't bog down. A truck engine powers the wheels in this experimental version. Eventually, the amphibious design will be applied to military and cargo vessels that need no docks or harbors to land at—they'd just roll out on the shore

Inventors of the items shown on these pages are as follows: 1. Rollo G. Smethers, Jr., Atlanta, Ga. (No. 3,520,502); 2. Theodore S. Daifotes, Box 641, Tuolumne, Calif. (No. 3,520,273); 3. Dudley Justin Gray, 7476 Jack-

son St., Ventura, Calif. (No. 3,517,632); 4. Otto Heinzle, Gotzis, Austria (No. 3,521,335); 5. Robert Gray, Ryde, England. Roger Shashoua can be reached at International Inventors Assn., Inc., 680 Fifth Ave., New York, N.Y. 10019

# How to Outfit for a Wilderness Canoe Trip

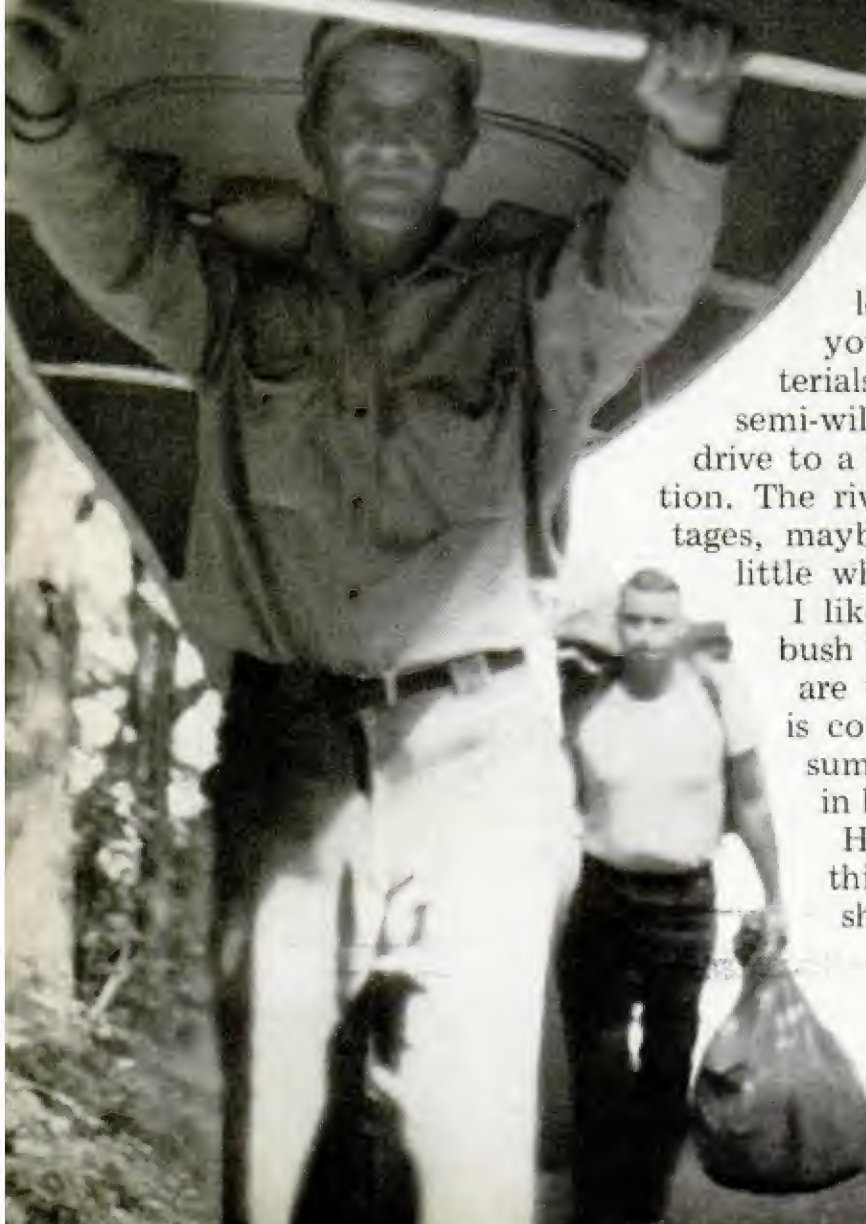
By NICK KARAS

ONE MAN'S wilderness is another man's back yard, and how to outfit or prepare for an excursion into either does and can differ considerably. There's no such thing as a standard outfitting list or technique because each trip will vary, based on the number in the party, the purpose of the trip, the kind of water to be traveled upon, the duration of the rides and the time of year the canoes go in the water.

The best approach might then be to set up a theoretical trip and let you modify it according to your needs. The following list of materials, then, is for two men canoeing in semi-wilderness country, that is, they can drive to a putting-in place and take-out location. The river they run will have a few portages, maybe a lake or two, some fast, but little white water.

I like the early fall for trips into the bush because black flies and mosquitos are usually at a low ebb, the weather is cooler and more pleasant than mid-summer and the trees are likely to be in better color.

How to canoe is another story; this one is concerned with what you should bring along to make it successful. "What" will depend on





### CANOE-CAMPING EQUIPMENT LIST

1-1/2 hp outboard motor  
 Seat and boat cushion  
 Outboard gasoline  
 oil mixed  
 Catalytic heater  
 Three paddles  
 Collapsible anchor

Cooking utensils  
 Cooking stove  
 Folding saw  
 Frying pan  
 Insect repellent  
 Backpack  
 Fishing and toolbox

Grate  
 Pack-in fishing rods  
 Anchor and bow lines  
 Poncho  
 Adirondack packbasket  
 Sleeping bags  
 Outboard bracket

Lantern  
 Ax  
 Food box, heavy plastic  
 with strapping lid  
 Canoe-carrying yoke  
 Pop tent  
 Folding shovel



### BASIC OUTFITTING LIST

Tent, ground cloth	Scouring pads
Sleeping bag(s)	Dish towel
Air mattress	Poncho, rain suit
Catalytic stove	Life jacket(s)
Fuel: stove, lantern	Seat cushion(s)
Lantern mantles	Paddles (3)
Flashlight	Carrying yoke
Spare batteries, bulbs	Anchor, anchor line
Cooking stove	Bow lines
Cooking utensils	Tie-down lines
Eating utensils	Canoe patch kit
Cooking grate	Plastic tape
Packsack	Stovepipe wire
Ax, folding saw	Outboard motor, 1½-hp
Folding shovel	Motor bracket
Insect bomb	Motor fuel
Stick matches	Topographical maps
Liquid soap	Compass

### BASIC FOOD LIST

Food lists depend on your personal taste, no pun intended. The following one covers only the basic staples, to which you can add the real bulk of the list—after planning meals, three a day, for every day you'll be away.

Shortening, flour	Evaporated milk
Margarine	Coffee, tea
Salt, pepper	Powdered chocolate
Sugar	Catsup
Dried milk	Mustard

### CLOTHING LIST

This list will depend greatly on the time of year you make the trip and how often you like to change clothing.

Windbreaker	Handkerchiefs
Light ski jacket	Hat, with visor
Long-sleeved shirts	Gloves: cotton
Undershirts	Socks: wool, cotton
Underpants	Shoes: field, tennis
Trousers, shorts	Heavy belt

### DITTY-BAG LIST

Toothpaste	Bath towel
Toothbrush	Sewing kit
Chapstick	Sunglasses
Pocket knife	Bar soap
Sheath knife (filet)	Paper towels
Insect repellent	Toilet tissue

### OPTION LIST

Camera, extra film	Fishing rods
Radio, CB radio	Tackle box
Tool and repair kit	Hunting equipment
Flares, whistle	Notebook, diary
Mirror	Pencil

### FIRST-AID KIT

Adhesive tape	Merthiolate
Antiseptic ointment	Needle, tweezers
Adhesive bandages	Gauze pads, strips
Burn ointment	Salt tablets
Aspirin	Halazone tablets

the things you insist on having to be comfortable away from home. Tolerances differ with the individual.

Before you start a trip into the bush, you should make a checklist of what you think you'll need. If you've done it before, you'll realize that you have several checklists, probably these six: a basic outfitting list, a basic food list, a clothing list, a ditty-bag or personal list, a list of options concerned with the primary purpose of the trip if it is more than just canoeing, and a medical list that can be cut to one if you pick up a complete first-aid kit.

Believe it or not, all this equipment will fit nicely into a 16-foot canoe with enough room at the gunwales for ample safety. The small outboard motor is on the basic outfitting list (left) for several reasons. In case of an emergency, you need it to get out in a hurry. If your trip doesn't end at a take-out place, it can get you upstream. It comes in handy for side trips up feeder streams and saves your time crossing lakes and on the open water.

Most equipment listed is self-explanatory. Unless you're taking along an extra large canoe, you can cut out some of the items. Remember, it all goes on your back each time there's a portage. The pop-type tent means you won't have to bring along poles or cut supports. An Adirondack packbasket is great because it's self-supporting and has canvas covers for use when it rains. Seat cushions are important to soften the load during the trip, serve as pillows and take the bumps out of rocks and logs around the campfire at night, as well as being lifesaving devices. Even so, life jackets should also be in the canoe and worn when the water turns white or a long crossing of open water is at hand.

When canoeing in the rain, what to wear is a toss-up. Many older canoeists prefer a poncho; it gives them arm freedom and can be used to cover other gear when you're not under it. However, some of the new rainsuits are equally comfortable and can be stored

in minimum space. The top also acts as a windbreaker on cool days.

If you don't take a fuel stove, then a fire grate is indispensable. Even if you have a stove, it's handy if the fuel should run out or you need an extra burner or two. It can be quickly set up between stones or logs.

If two paddles are good, then three are better to take on a trip. They have a way of breaking; the spare should always stay lashed inside the canoe in case you lose a paddle in a spill. It's too difficult to cut a new one in the bush that is as light or efficient as the extra one you bring along.

Spare batteries for a flashlight are fairly standard in most outfitting kits, but be sure to add a few bulbs. They do burn out and take such little space. Canoe repair kits—aluminum especially—can consist of heavy, reinforced tapes or tubes of liquid metal. A rubber patch kit for your sleeping bag or waders is also a good item to throw into the bag.

Sleeping and clothing bags should be of waterproof plastic or rubberized cloth. There's nothing worse after a hard day on the paddle than a wet sleeping bag when it didn't even rain.

Electrician's plastic tape and stovepipe wire will have endless uses. A pair of pliers and a screwdriver should be in your tackle box. They're handy in so many unpredictable ways.

A Citizens Band radio is rather limited in range, with a maximum up to 20 miles. But sometimes that might be all the distance you need for an answer to your call for help. At night, the bounce can carry your plea halfway across the country. A portable radio is also a good idea. In some heavily canoed areas, radio stations have special programs for canoeists with messages from the outside world.

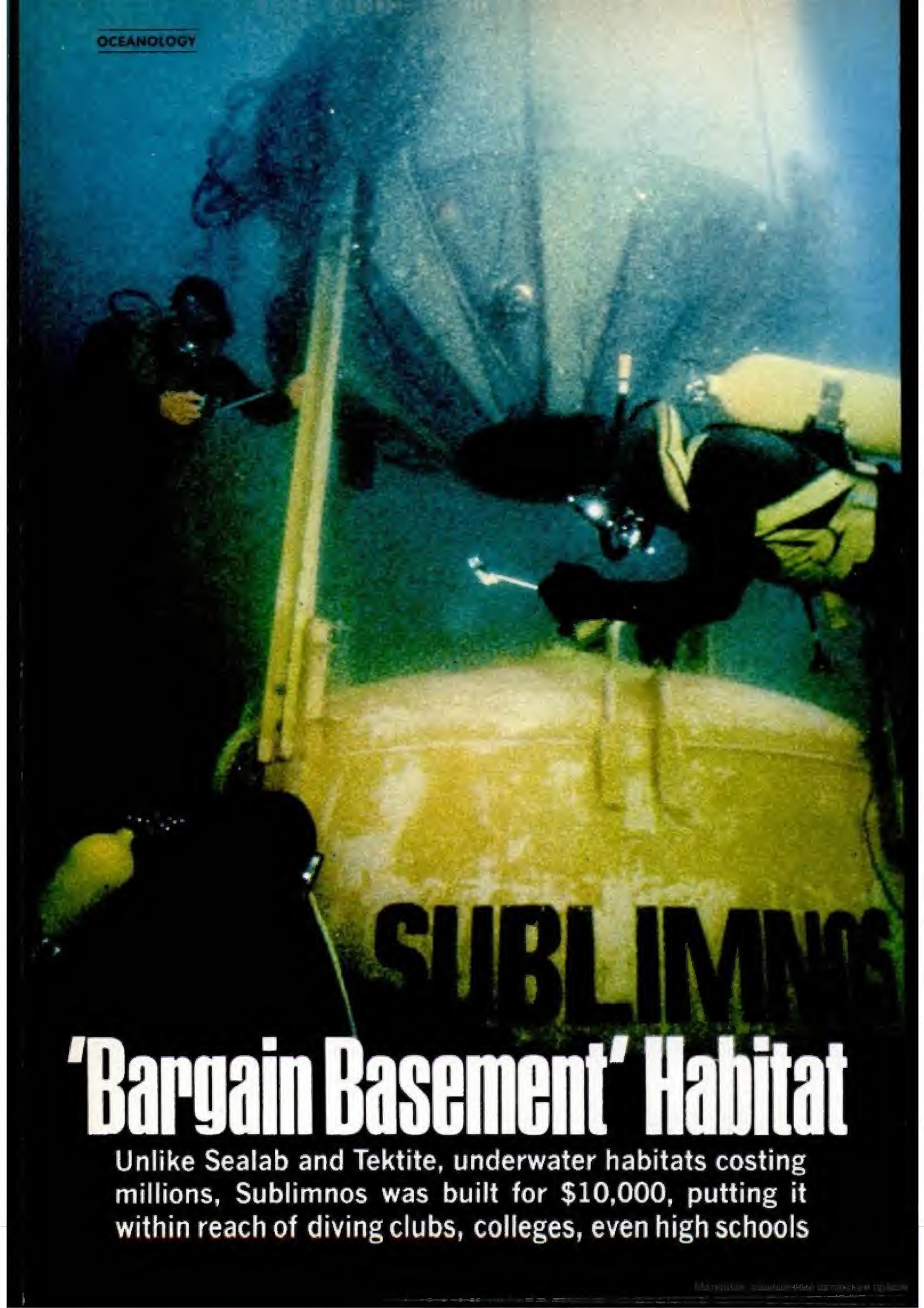
You might not find all the items on the lists helpful, or you might want to make additions to it to suit your own needs. The list may have only given you a few ideas, but it's a place to start to build your own outfitting guide. ★★

APRIL 1971



### Collection of energetic toys

Noted restaurant-owner Claude Terrail (Tour d'Argent, Paris) has a collection of more than 100 animated toys from all over the world. At top, he displays a tumbling clown from Tokyo. Other toys include a dice-throwing craps shooter, xylophone player (four tunes), skating bear, cigar-smoking roisterer.



# SUBLIMNOS

## 'Bargain Basement' Habitat

Unlike Sealab and Tektite, underwater habitats costing millions, Sublimnos was built for \$10,000, putting it within reach of diving clubs, colleges, even high schools



ON THE OUTSIDE: Divers check bolts (top photo) and dome (above, left). Inside: Doug Elsey (center) rests by window; author (right) pops through hatch

By DOUGLAS L. HICKS / *Technical illustration by Fred L. Wolff*

A FEW FEET AHEAD I could see Doug Elsey's fins pumping the water in the powerful rhythm of the trained scuba diver. Then he looked back and gestured, and just beyond his upraised head I caught my first glance of Sublimnos.

It rested there, 32 feet deep, in the clear, chill waters of Georgian Bay, Ont., Canada. It looked like two potbellied stoves, one about three feet above the other, connected by spindly steel supports. The top belly had been painted in alternating stripes of blue and yellow, and now the paint was peeling in big blisters, like a Bahamas sunburn.

Doug swam in a circle around the top belly, and I fol-



lowed. A glass eye looked out at me from each side, and sitting atop the structure, like a little derby hat, was a transparent viewing dome. Doug motioned to me to follow him into the space between the two units. A moment later my head burst up through an open hatch. I took the regulator out of my mouth, lifted my face mask and looked around. I was standing on the bottom section, and my head was thrust up into the top belly of *Sublimnos*.

*Sublimnos*: an underwater habitat, a house beneath the waves. Everyone with an interest in diving has heard of the famous *Tektite* habitat, the U.S. Navy's *Sealab*, Jacques-Yves Cousteau's *Conshelf*, and *Aegir*, the habitat developed at the Makapuu Oceanic Center in Hawaii. Each requires elabo-

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**Imaginative young divers  
could build a similar habitat  
for less than \$2000!**

---

rate surface-support vessels. Each costs thousands of dollars per day to operate. Only a relatively few scientists have ever had the privilege of using them.

*Sublimnos* is something else. It cost only \$10,000 to build, and that came from the pocket of its remarkable developer. Less than two years old, *Sublimnos* has already logged more hours of use than all the other underwater habitats in the world combined.

Perhaps best of all, it's the kind of structure that members of local diving clubs or university students can afford to build and operate. Dr. Joe MacInnis, who developed *Sublimnos*, thinks that a group of imaginative young divers could build a habitat similar in size, complete with a life-support system, for less than \$2000!

"First of all, there's no reason for a habitat to be made of steel," says Dr. MacInnis, "or of any other rigid material. The vinyls, plexiglass and some of the other plastics would work beautifully, and can be fabricated by amateurs.

"All that's really needed is a structure strong enough to support a bubble of air the size desired. Beyond that, most diving clubs or universities already have air compressors and generators for a life-support system—and if not, most enterprising young divers are adept at scrounging such gear locally."

As a model for miniature habitats, *Sublimnos* has a distinguished record. It is the world's first freshwater habitat; the only habitat operating under ice; the only one to serve as an underwater high school and college classroom. And, instead of a handful of scientists, it has been used by more than 3000 enthusiastic divers, from a junior-high kid working on a science project to engineers, artists, sculptors, medical students, geologists and even a fashion designer.

*Sublimnos*. It's a made-up word, taken from the root word, "limnology," meaning the study of the physical, meteorological and biological conditions of fresh water.

"All the other habitats in the world are Rolls-Royces compared to this one," says Dr. MacInnis. "I tried the Volkswagen approach, and it worked."

Dr. MacInnis is a rip-roaring, life-loving young Canadian. He's a physician who works as director of diving research for Ocean Systems, Inc., a worldwide industrial diving firm affiliated with Union Carbide Corp., and he numbers among his personal friends many of America's astronauts and aquanauts. MacInnis, himself, is a qualified diver to 650 feet.

"I'm an impatient man," he says. "When I first conceived of a Volkswagen-size habitat, I could have applied for Canadian government funds and probably would have received a grant in five or ten years. But after all, the Wright brothers didn't wait for government sponsorship. I didn't want to wait either."

He shelled out of his own pocket the \$10,000 required to build *Sublimnos* and its life-support system. He subsequently received an operating grant from the National Geographic Society,



and, thanks in part to his "open hatch" policy, he has received equipment and technical help from several manufacturers.

The "open hatch" principle, rather than the small size or low cost of the habitat, really is the major difference between *Sublimnos* and the larger, deeper and better-known habitats.

"The open hatch," says Dr. MacInnis, "simply means that *any* qualified diver of *any* age from *anywhere* who has a legitimate reason for using *Sublimnos* is welcome to do so—free. All he has to do is write me so we can schedule diving time. We can afford the open-hatch policy because we operate on what I call 'people power' instead of money power. Enthusiasm frequently can be more effective than dollars, and most of our workers are enthusiastic volunteers. Furthermore, we left all the frills out of *Sublimnos*."

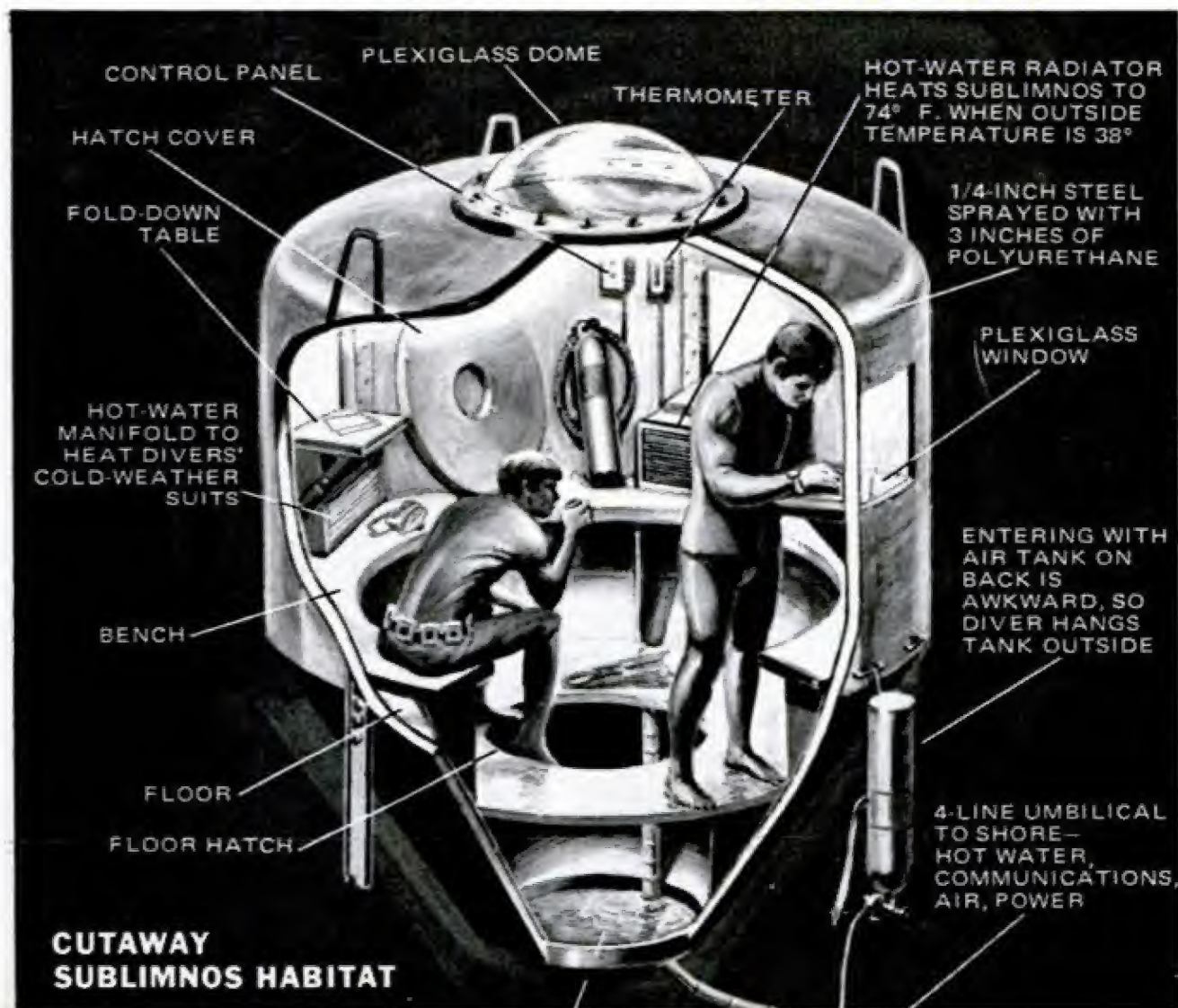
Indeed, the habitat is a spartan dwelling. If a diver expects a refrigerator,

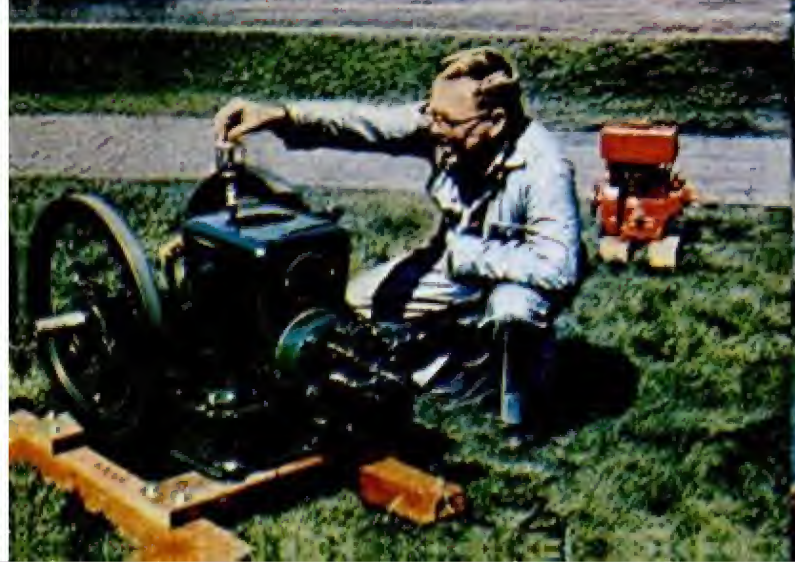
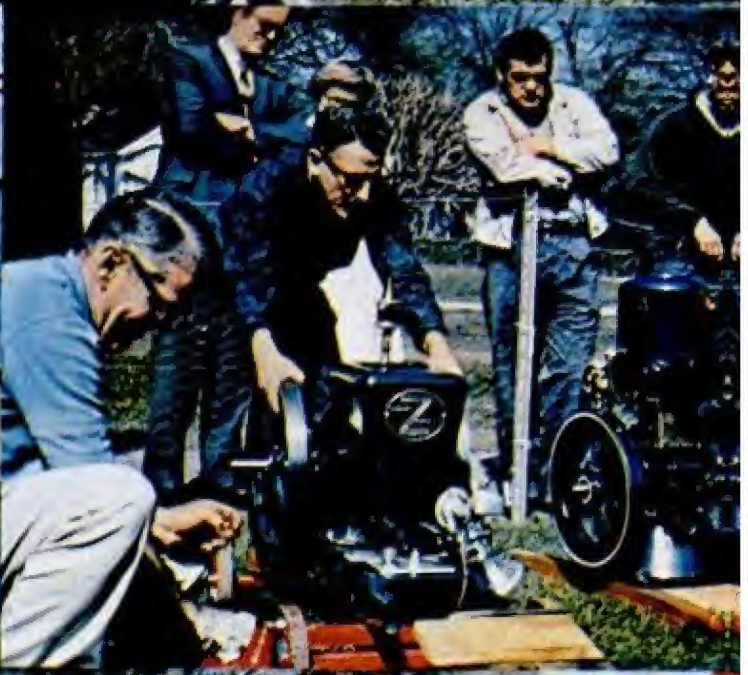
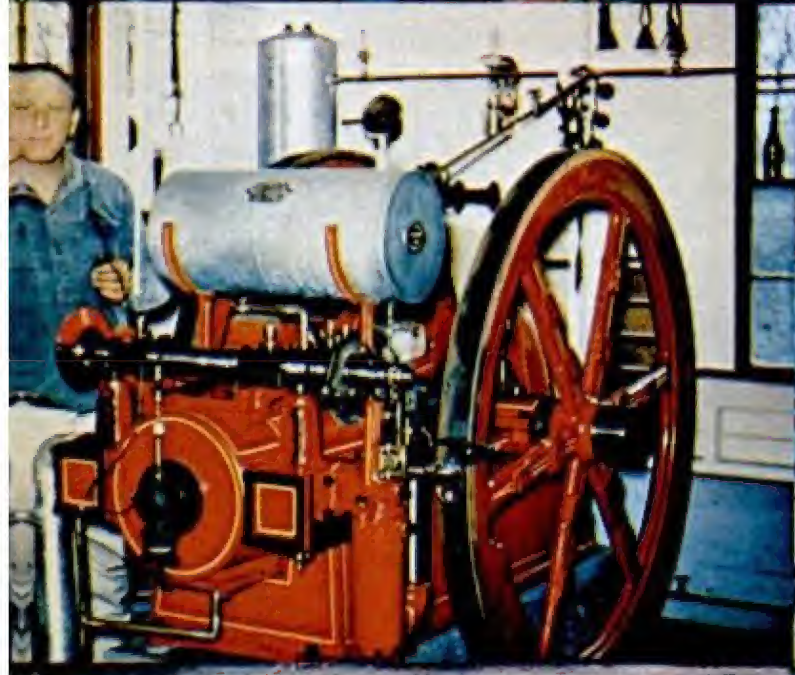
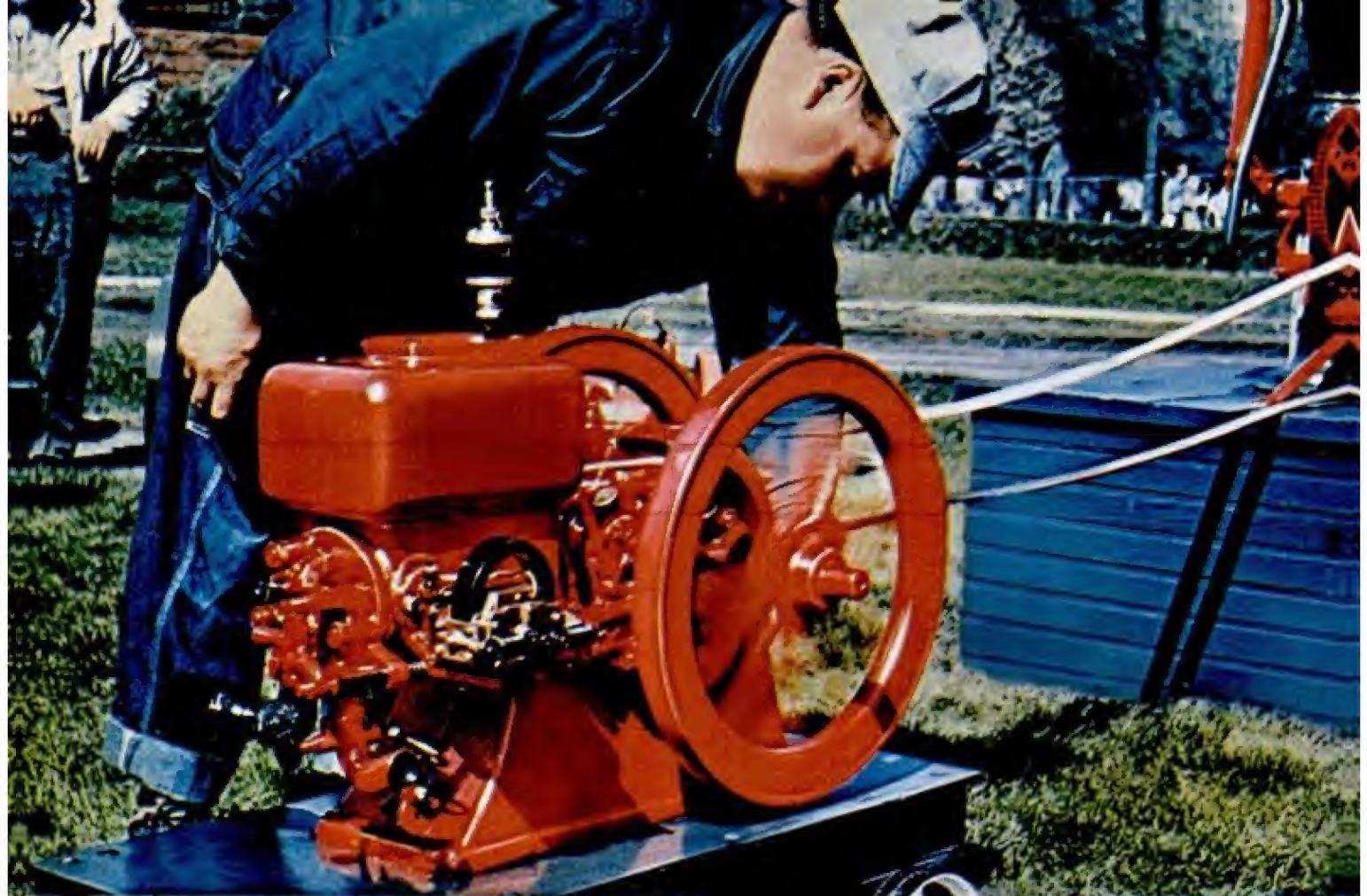
a well-stocked kitchen, comfortable bunks and a toilet, he's in for a jolt. When I poked my head up into the air bubble inside that potbellied stove, I first heard the *hiss* of compressed air and the lap of water around the hatch. Light streamed in from the transparent dome and the four windows. The first thing I saw on the concave wall was a Canadian flag.

We climbed up through the hatch and dropped the cover into place so we'd have a floor beneath our feet. I sat down on the bench that runs around the perimeter. In front of me was a sign that read, "Caution: Polluted Air." It really wasn't polluted, but the sign is a reminder that life-support accidents do happen, even in habitats.

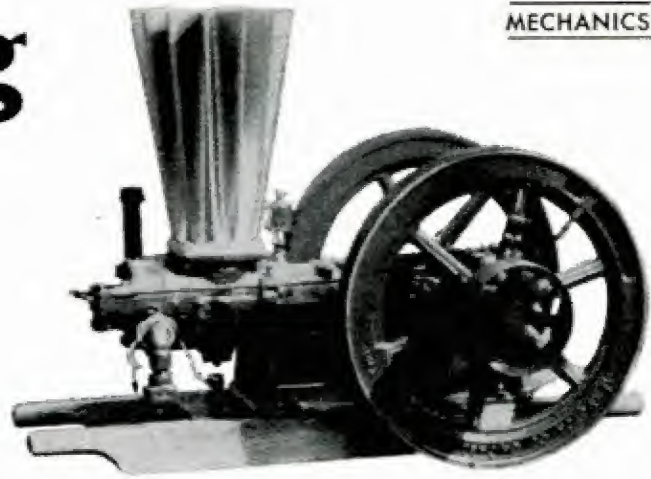
In front of two of the windows were fold-down tables. Scattered around the walls were hooks for gear. Halfway up the wall was a little lamp on a drooping gooseneck. The humidity was so high

(Please turn to page 178)

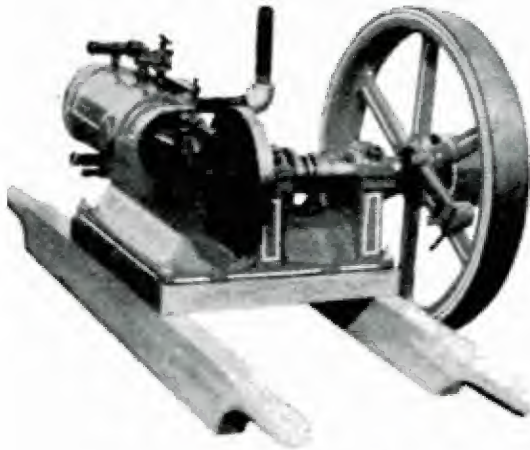




# They Bring 'em Back To Life!



FLUTED FUNNEL is radiator on 3-hp Aermotor



CROSSOVER CAM in place of timing gear was used on the 1½-hp Gearless

**Nothing could be more challenging to an Early Engine Club member than to find an antique monster that looks hopeless and can be purchased for a song. And that's when the fun begins**

By **ROBERT E. BLACK**

*Photos by the Author*

**A**T PUBLIC SHOWINGS of the Early Engine Club, held each spring at Greenfield Village in Dearborn, Mich., you can see gas, steam and hot-air engines that Granddad used before electricity came to farms and small towns. Most are authentically restored, all run, and many do jobs for which they were built—shelling corn, pumping water, grinding feed, or sawing wood.

Members of the Early Engine Club range from teen-agers to retirees. The club was organized in 1963 by a few men who had been collecting and restoring old engines. Now the 110 members share information and sell or swap parts. They restore engines for the Henry Ford Museum, which is a good deal for everybody; the museum gets expert labor free and the members get to work on rare engines.

**EARLY ENGINE CLUB MEMBERS** display their restorations at Greenfield Village. Top, a 1½-hp Economy engine being used to pump water; center left, 4200-pound Springfield built in 1896; center right, 1½-hp Fairbanks-Morse Model Z is started by hand; bottom left, author's 1917 Fairbanks-Morse is 3 hp; bottom right, 2-cylinder steamer, maker unknown

APRIL 1971

To find an old engine, the enthusiast usually starts by following up rumors. A surprising number of these engines are still doing the work they were built for. Because they are reliable, their owners have no desire to part with them. In cases like this, the enthusiast looks elsewhere and then occasionally checks up on the engine he can't buy. The heirs of a late owner will usually sell an antique engine at auction, where its true value will soon be decided—usually a little more than junk prices. A steam threshing engine is another matter; bidding is likely to be fierce.

Why do men collect and restore old engines? One reason is the thrill of bringing to life a machine that has been silent for many years. Another is to admire how unknown designers and craftsmen solved the problems of making an engine that was economical, reliable and safe. The antique-collecting instinct is strong in many of us. There are old engines waiting in barns and basements. Finding them is possible. Restoring them is challenging. ★★



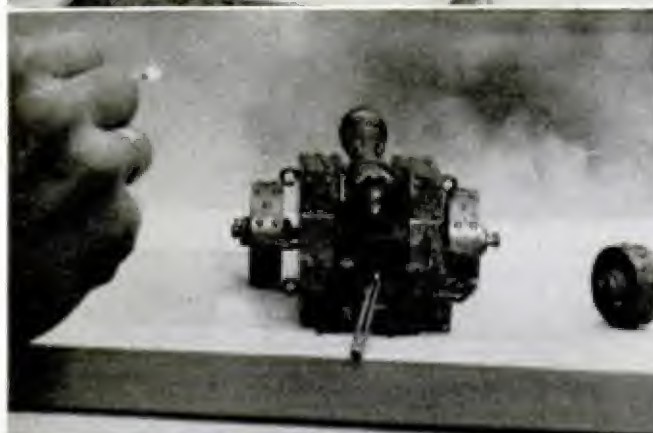
### Minicar with hydraulic lift

Confined to a wheelchair, Jack Harris of Mesa, Ariz., designed his own electric runabout so he wouldn't have to be chauffeured around town. The electric car has a self-contained hydraulic system to raise and lower the body so a wheelchair can roll aboard.



### TV probes brain

After injecting radioactive material into arteries that lead to a patient's brain, doctors at UCLA's Nuclear Medicine and Radiation Biology Lab watch the progress of the material on TV. The new technique speeds up diagnosis of cerebral disorders.



### Artillery 'battle' in his living room

Once a week, the sound of gunfire shatters the quiet of Franz Stollberg's home in Hamburg, Germany, when he and friends hold an artillery-firing contest with authentic miniature cannons he builds. Using tiny cannonballs and a special gunpowder mixture developed by Mr. Stollberg, the contestants take aim and fire the weapons in the same fashion the full-size originals were fired. All of the cannons are models of actual weapons that were used to fight battles in Europe and are now in museums.



## Safety belt that you can't forget to fasten

The British Road Research Laboratory has developed a safety belt you can't forget to fasten. Attached at one end to the door and at the other end to an inertia roller, the belt automatically crosses the driver's chest when the door is closed. The driver is free to move unless there's a sudden jolt; that causes the inertia roller to lock the belt.



## Car at the bar

Racing-helmet lights and a 1929 Brookland-Riley race car are typical of the decor of the Autpub, a new restaurant in New York.



## For sailing around

That thatched roof is just one of a number of options offered by Resort Products in its unusual circular boat, the Roundabout.



## Old-timers still racing

Racing vintage cars has become a popular (and expensive) sport in Britain. Among those in a recent race sponsored by the Vintage Sports Car Club were a 1927 Bugatti (above) and (left) a 1935 Austin and 1937 HRG.

# More Muscle For Little Tractors

These babies are really rugged and powerful.

They're the answer for anyone who needs the heft of a small farm tractor with the maneuverability of a compact.

By **JAMES M. LISTON**, Executive Editor  
*Technical Art by Fred L. Wolff*

**F**OUR MANUFACTURERS are rolling out a new kind of tractor that combines the durability of a small farm tractor with the recognized advantage of a compact—maneuverability. Three have gone to a two-cylinder, horizontally opposed engine; another—International Harvester—has chosen a classic four-cylinder, liquid-cooled engine with cast-iron crankcase and cylinder head.

Recently there was a “small-horsepower race” in the garden tractor industry, with single-cylinder air-cooled engines climbing from 10 to 12 to 14 hp. The bigger engines were needed to compensate for the loss of horsepower to that popular option, hydrostatic transmission.

The new engines—which range from a rated 15 hp for International, 16.5 for Gravely and Simplicity, to 18 for Bolens—are not considered new entries in the horse race. These aren't merely lawn and garden tractors with larger engines. They aren't meant to displace 10, 12 and 14 hp on suburban lots. All four manufacturers clearly stake out the territory in which these muscle tractors will show to best

**SIMPLICITY MODEL 4040** makes short work of tall grass with 53-inch rotary cutter. With 60-inch mid-mounted rotary (below), it has a 16.5-hp engine



advantage: small acreage farming, estates, industrial and commercial use, and the large-area mowing and snow removal done by contractors. Yet this rugged equipment is bound to tempt many men who don't need this much tractor but are fascinated by machinery that's better than it has to be.

Simplicity's Model 4040, which the company calls a “super-compact high clearance tractor,” is powered by the Onan



**INTERNATIONAL 154 CUB LO-BOY** has four-cylinder water-cooled engine of 15 hp. It weighs 1350 lbs.

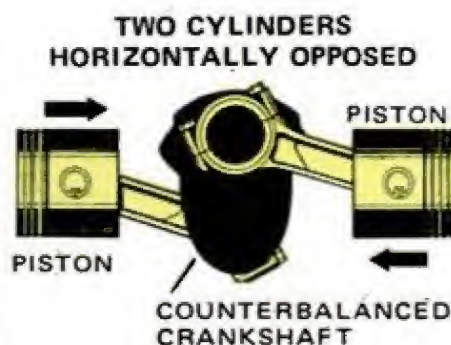
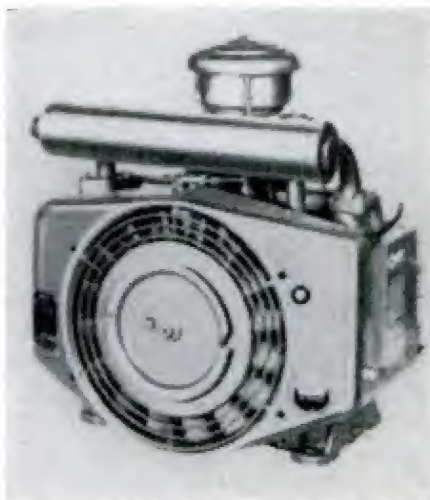
Model CCKA 16.5-hp engine. This engine has been used for over a decade in heavy-duty material handling equipment and industrial vehicles. The same Onan engine (rear mounted) powers Gravely's new Model 450. The two horizontally opposed cylinders level out vibration to a minimum. The engine has 3½-inch bore, 3-inch stroke, 49.8-cu.-in. piston displacement, 7 to 1 compression ratio, 16.5 bhp at 3600 rpm. It also has full-pressure lubrication provided by a gear-type oil pump to the main and connecting rod bearings. The mains and connecting rods have replaceable inserts.

Simplicity's Model 4040 has 15-inch ground clearance without the drawbar. Drawbar height is 13 inches. The length

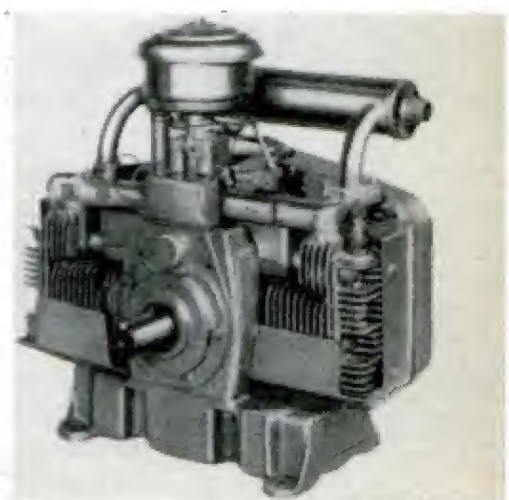
overall of the 4040 is 83 inches and width overall with high flotation tires is 56 inches—with agricultural tires set for narrow width, it's 42 inches. (Wheels are offset and can be reversed to vary tread to suit crop row spacing.)

The 4040 weighs in at 1300 pounds—more than 50 percent heavier than the company's largest garden tractor. This, coupled with a drop axle final drive to give the tractor a lower center of gravity, provides stability and traction.

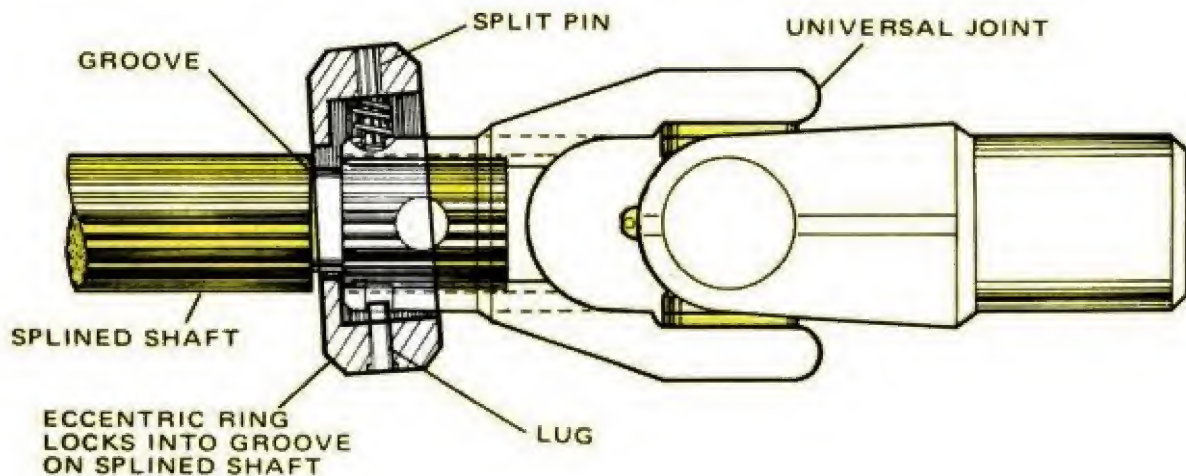
Wheelspin on garden tractors has long bugged owners who know their machines have plenty of power for the job but can't maintain traction. The 4040 meets the problem with automatic limited-slip differential and independent rear-wheel disc



**ONAN TWO-CYLINDER ENGINE** in Simplicity and Gravely tractors has 7 to 1 compression ratio, 49.8-c.i.d. and full-pressure lubrication



## Bolens collar-locking PTO coupling



brakes that can be used to slow the slipping wheel.

There is a front power take-off (PTO) for front and center-mounted attachments that is controlled by an electric clutch. A rear PTO is optional and has its own electric clutch. A hydraulically operated power lift raises and lowers rear attachments. A front power lift is optional.

The hydrostatic transmission is coupled to a three-speed geared transmission. A warning light that automatically indicates improper gear choice is standard. Hydrostatic, of course, permits a constant engine speed with varying loads and ground speeds and makes for quick shuttling when grading or removing snow. A soft ride valve cushions starting shock, and oil in the hydrostatic system is run through an arched cooler that is force-cooled by an engine fan.

Use of floodlights mounted in the rear fenders to provide good lighting for front and center work areas is a practical idea borrowed from farm tractors.

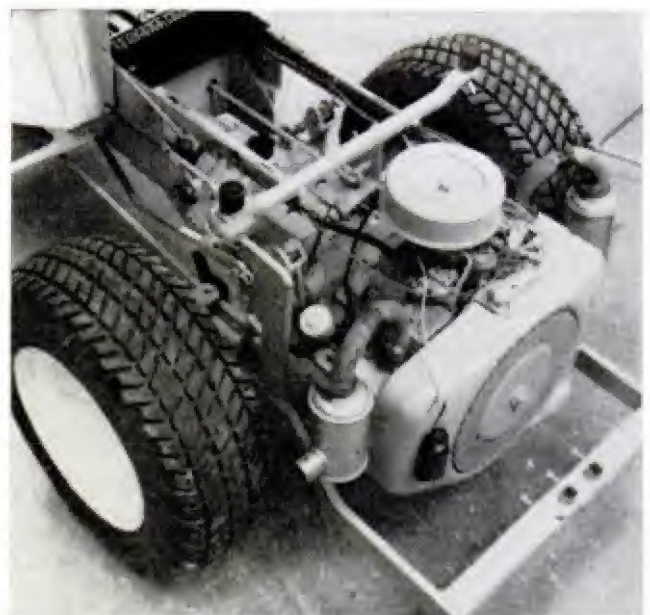
Among attachments for the 4040 are a 60-inch mid-mounted rotary mower, a 53-inch rear-mounted pivoting rotary mower, a front-end loader, 60-inch snow and dozer blade, a 52-inch snow thrower, 12-inch moldboard plow, and a rear-mounted forklift.

With the two-cylinder Onan engine mounted at the rear, the Gravelly 450 has only 7 inches ground clearance but its extremely low center of gravity gives it great stability. The 148-pound engine and the transmission and differential are mounted directly over the rear wheels, giving the 450 excellent traction. A slight

touch on the brake of the slipping wheel stops wheelspin in tough going. Gravelly mounts twin mufflers on the Onan to hush still more the low growl that comes from two cylinders firing alternately.

Long a builder of durable commercial equipment, Gravelly uses its automotive-type planetary-gear transmission, which it claims delivers about 80 percent of the engine power directly to the attachment. This gearbox does not require clutching.

The 450 uses the frame of the Gravelly Commercial 430 model. The 450 weighs 950 pounds, is 75½ inches long, 41¾ inches wide and 43 inches high at the steering wheel. Attachments include a 50-inch center-mounted rotary mower, 40-inch front-mounted mower, 42-inch snow and dozer blade, 38-inch snowblower and



**ONAN TWO-CYLINDER ENGINE**, with twin mufflers, is rear-mounted on Gravelly's Commercial Model 450



**BOLENS MODEL 1886** (right) is powered by two-cylinder, 18-hp Kohler engine. The 1045-lb. tractor, shown with 54-inch rotary mower, has hydrostatic transmission, hydraulic lift as standard equipment. Bolens' power-takeoff attachment system (left) uses a universal joint and splined shaft. The shaft locks with finger pressure and an eccentric collar lock



Gravely's exclusive front-mounted rotary plow. Model 450 sells for about \$1800.

Bolens' new Model 1886 is powered by a two-cylinder, 18-hp Kohler K482 engine. This engine was introduced by Kohler in 1965. Bolens says it chose it for two reasons: it was designed for long, hard use (it's widely used for auxiliary power-plants); and, second, its balanced, horizontally opposed design eliminates all vibration that must be damped out of single-cylinder 12 and 14-hp engines.

Bolens built a new tractor from the frame up, using some things found in commercial earthmoving equipment—such as a channel frame and heavy front axle assembly—and automobiles. The 1886 has an automotive-type coil ignition, a standard automobile air filter, automotive-

type muffler, a 45-amp. auto battery, and the controls are as nearly like an automobile as possible with Park, Neutral and Drive positions for the foot-control hydrostatic transmission. The similarity to automotive design means the operator doesn't have to learn new routines and this will, Bolens believes, prevent a lot of breakage and downtime.

The 1886 is heavy—1045 pounds—and stable. An operator working for hours in tight corners with a mover or a forklift on the rear will find power steering necessary and Bolens offers it as an option. A two-spool hydraulic lift permits simultaneous lifting and angling of the blade. There is also a rear hydraulic takeoff. The muffler, a four-bolt horizontal attachment, can be mounted stack-style so the exhaust is above the operator.

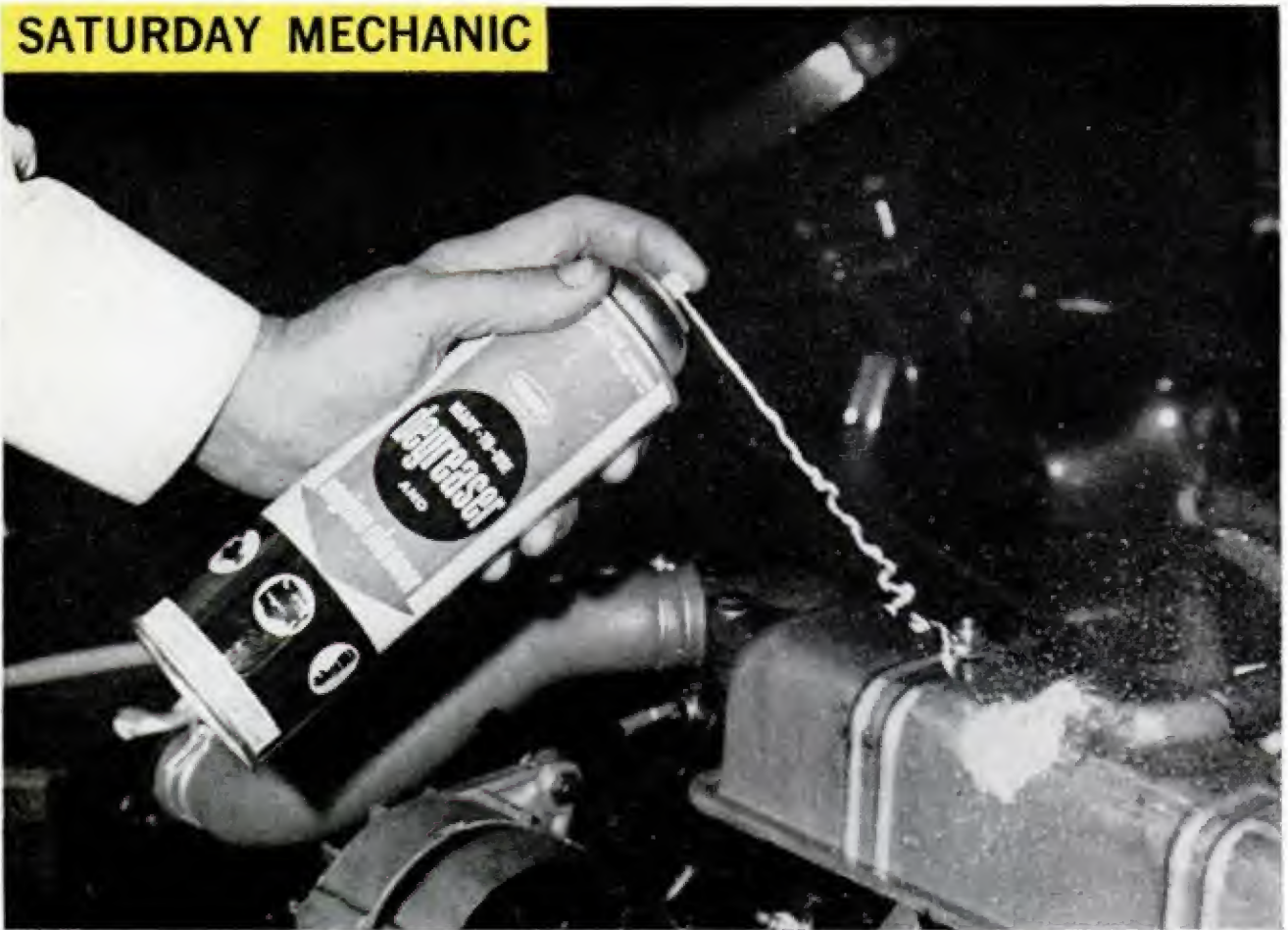
The 1886 sells for approximately \$2100 and mounts a 54-inch rotary mower, a 42-inch snow caster, a 54-inch snowplow and grader blade, a moldboard plow, a front-end loader, and many—35 in all—special attachments that can use its power.

The International 154 Cub Lo-Boy, heaviest of them all, weighs in at 1350 pounds and sells for \$2125, f.o.b. Louisville. This model, introduced two years ago, is a low-slung restyling of the famous Cub (which is still available). Ground clearance is 13 inches, compared with the Cub's 20.4 inches, and height to top of steering wheel is 49 inches, compared to the Cub's 62.8 inches. Overall length is 94 inches, 5 inches less than the Cub's, and the weight is 262 pounds less.

The Lo-Boy's engine is the classic In-  
(Please turn to page 176)



**GRAVELY 16.5-HP MODEL 450**, shown with 50-inch rotary, has all-gear drive to powered attachments

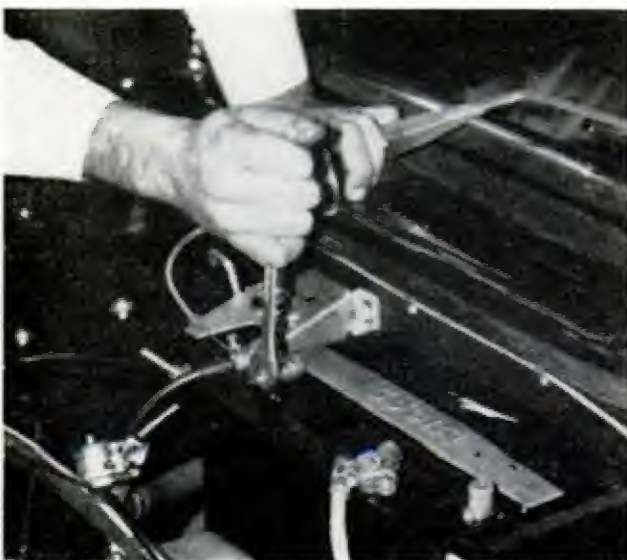


# How to clean up DIRTY MECHANICAL

A spotless engine is very satisfying and it can eliminate the

**DISCONNECTING BATTERY** is safe practice before degreasing engine. Clean the terminal and cables thoroughly so corrosion doesn't block flow of current

**CLEAN BATTERY** with a solution of baking soda to neutralize acid. Take a hose to the battery to make sure acid and baking soda deposits are washed off



**O**VERHEATING OF AN ENGINE that was apparently running perfectly proved to be a most perplexing problem to a reader who wrote to *PM's Auto Clinic* recently. His 1968 Pontiac Catalina was overheating and none of the three mechanics he had consulted had been able to alleviate the condition—until one of the more fastidious among them got his turn at the troubleshooting. One look and he had found the cause of the overheating: a dirty, grease-coated engine.

To prove his diagnosis, he took a thermometer reading of the radiator coolant at maximum temperature before cleaning the engine. It read 263°. Then, after he had cleaned the engine, the thermometer read 228°. The insulating effect of dirt had caused the engine heat to rise by 35°!

Overheating is just one of the mechanical problems that engine dirt causes. Others include reduced current from batteries, hard starting, stalling and poor acceleration. Dirt on the electrical terminals impedes current. Dirt on the accelerator and choke linkages causes performance problems.

The easiest way to clean an engine completely is with a spray degreaser. Before using it, however, you have to take some preparatory steps.

First, disconnect the battery cables and keep them disconnected until all cleaning is done. This is a precautionary measure you should take to guard against a short circuit.

If a metal object should accidentally drop and hit the hot terminal of the cranking motor solenoid while the battery cables are hooked up, the resulting short would damage fuses, diodes, wiring and other electrical components. A short also creates sparks, and degreaser and engine cleaner is highly flammable. Obviously, the smoking lamp is out while degreasing is being done.

After the battery cables are disconnected, clean dirt and electrolytic salts from the cable terminals with a battery-cleaning tool, which you can buy in an auto supply store.

Now, stick a piece of masking tape over each battery cap to prevent battery-cleaning solution, which neutralizes acid, from getting inside the battery. Then scrub the battery case with a scrub brush and a mixture of baking soda and water. Follow this with a thorough rinse of water from a hose.

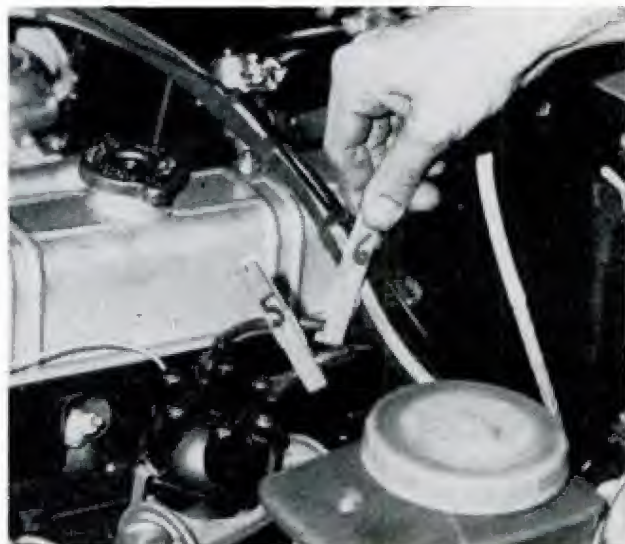
Keep repeating this procedure of scrubbing and rinsing until the baking soda no longer fizzes when applied. This means

# PROBLEMS

By MORT SCHULTZ

## possibility of some very tough troubleshooting

**REMOVE CABLES** from the sparkplugs, distributor and coil and use spring-loaded clothespins to mark the cables so they will all go back in the right place



APRIL 1971

**DISTRIBUTOR CAP CONNECTIONS** can be covered and marked at same time using tape that won't allow spray degreaser and water to collect in the holes



117

that acid salts on the battery case have been neutralized.

Depending upon the number of cylinders in your engine, prepare four, six or eight clip-type clothespins on which you have written a number from one to four, one to six, or one to eight. Prepare an additional clothespin for the coil-to-distributor cable.

Remove all of the sparkplug-to-distributor cables as well as the coil-to-distributor cable. As you do this, clip the appropriately numbered clothespin to each cable so that you will be able to match the cable and its sparkplug later. Clip the clothespin with the word "coil" onto that cable.

To match the cable to its correct place in the distributor cap, you can cover each hole with a small piece of masking tape on which you've written the number which corresponds to the number on the clothespin.

As you remove each cable, wipe it clean with a cloth. Now, cover the distributor cap and oil filter cap with polyethylene sandwich bags to protect them from water during degreasing.

If you have an underhood insulation pad, unclip it and, if it isn't too dirty, wash it in detergent. If it's too far gone, get a new one. Be sure to degrease the underside of the hood before installing the new pad.

Now, remove the carburetor air cleaner. Lay the filter element aside and hose down the cleaner's metal parts. If parts are greasy, give them a shot of engine degreaser, but do not spray the filter ele-

**PLASTIC SANDWICH BAGS** are perfect for covering distributor, coil, carburetor venturi or other parts you want to keep perfectly dry while hosing engine



ment. Incidentally, just how long has it been since you've changed that element?

Using a small scrub brush (an old toothbrush will do a good job here) and some kerosene or gasoline, clean the carburetor and all of its linkages. Be thorough in your work.

Before covering the carburetor venturi (use a piece of household cling-type plastic food wrap), apply a choke cleaner to the choke-plate shaft and linkage. The choke cleaner and engine degreaser, both of which come in spray cans for easy application, are available in auto supply stores.

Finally, carefully clean out as much debris and as many bugs as you can from the radiator fins with a soft bristle brush, and inspect the engine for caked-on dirt. Scrape off as much dirt as possible with a putty knife. If you leave only surface dirt for the degreaser it will do its job much more quickly.

Spray all parts of the engine and engine compartment, including the radiator, underpart of the hood, fender splash shields and firewall. Follow the application instructions printed on the can. Usually, though, the engine should be warm when degreaser is applied. For this reason, you should allow the engine to idle for a time before you perform the first step of cleaning, which is the disconnecting of the battery cables.

Let the degreaser eat away at the dirt and grime for about 15 minutes. Then, wash down the entire underhood area and engine with a forceful stream of water. If some dirt and grime remain, apply another

**HIGH-PRESSURE SPRAY** from nozzled garden hose will blast away grease and grime accumulation after degreaser has had about 15 minutes to loosen it



dose of the degreaser and repeat the operation.

After you have finished the cleaning, reinstall the carburetor air cleaner, and reconnect the sparkplug and battery cables. Be sure they are tight. Then start the engine and allow its heat to dry away water.

Now that your engine is again spotless, check it every few days for signs of an oil or grease buildup. This is the time for you to detect and fix possible oil leaks that may be causing your engine to get dirty faster than it should. Check around the oil filter and look closely around all fittings in the block, such as the oil pressure sender.

Although it's not necessary from the standpoint of preventing mechanical headaches, you may wish to really clean up the engine compartment by painting those areas that were originally painted, such as the firewall and fender splash shields—maybe the block. That's fine, but watch it.

First of all, be sure to use a paint which is intended for the purpose—one that is heat-resistant.

Secondly, apply paint only to those areas that should be painted. Be especially careful to keep it away from all electrical connections, wiring, and rubber components.

To do a really thorough job, put your car on a lift and clean the underbody components, including the underside of the engine block, the transmission case, driveshaft, differential, exhaust-system components, the frame and suspension parts.

**WHEEL WELLS** also can be cleaned of accumulation of caked mud with high-pressure spray. In winter, remove corrosive salts from underbody this way, too



APRIL 1971

And as long as you're doing the work, you might as well clean out caked mud collected in the fender wells. Use water pressure.

The single most important part to clean in order to prevent a mechanical headache is the driveshaft. Any mud that gets on and sticks to the driveshaft can create an unbalanced condition to set up harmful vibration.

Use an engine degreaser or kerosene to clean the driveshaft. You need just wipe it down.

Dirt on the other underbody areas won't normally cause any mechanical problems to develop. However, building up steadily over the years, mud and grime could add a considerable amount of weight to the vehicle.

There are a couple of things to remember about cleaning the rest of the car. For example, inside the car, never use auto polish or abrasive cleaner on the bright trim pieces. You're likely to rub away the finish because most such pieces are not made of chrome. They are aluminum-coated plastic. To clean them, simply wipe away the dirt accumulation with a damp cloth or sponge, and buff the plastic pieces with a soft, dry cloth.

Vinyl roofs look great when they're new but they do lose their luster when covered with stains and contaminants that won't come off when they are washed in the normal manner. They require a special treatment.

Start by washing away all surface dirt. Then wipe the roof dry. All car manufacturers have developed a cleaner that will eliminate stains and contaminants from vinyl. Ask for it at the parts department of a dealer who sells your make of car, preferably, or try an independent auto supply dealer.

Follow directions printed on the can. Customarily, though, a pad of cheesecloth is saturated with the vinyl cleaner and is then placed over the stained area for several minutes. After that, the area is scrubbed briskly with a cloth, to be followed by another application of the cleaner, if necessary.

A knotty problem that you may face when cleaning the car's body is how to remove those splattered insects on the grillwork. A solution of washing soda and water applied with a soft sponge, followed by rinsing, does the trick. ★★★

# FISHING TIPS

By CALVIN A. DeVINEY



## SAVE THAT BAIT-CASTER!

Spin-fishing may be more popular today, but that's no reason to neglect the level-winding reel that gave you or your father so many seasons of dependable service. Especially when it's ideally suited to catching bigmouth bass! If you disassemble a bait-casting reel with care, even a child can see how it works and how to get it together again. Make use of a brush or screwdriver in the tough spots to clean away dirt and rust.

If you find any pieces that are too rusty or corroded to restore, the chances are you can duplicate them at your local tackle store since many dealers make it a practice of collecting old reels in trade-ins.

If you find any stiffness in operation when you reassemble your reel, apply a little oil on all moving parts and crank loose the stiffness. Keep it well oiled thereafter, and it will last another lifetime.



**EMERGENCY ITEMS** for your tackle box: paper clips, thread and nail polish. You can improvise a rod guide from a straightened paper clip with a loop formed in the middle. Give the loop a half twist so it will hold line after mounting and cut off the excess wire. A small spool of thread and some nail polish provides instant guide windings and glue. Nail polish is also useful in cementing frayed windings on other guides to hold them until you get home for a more permanent setting.



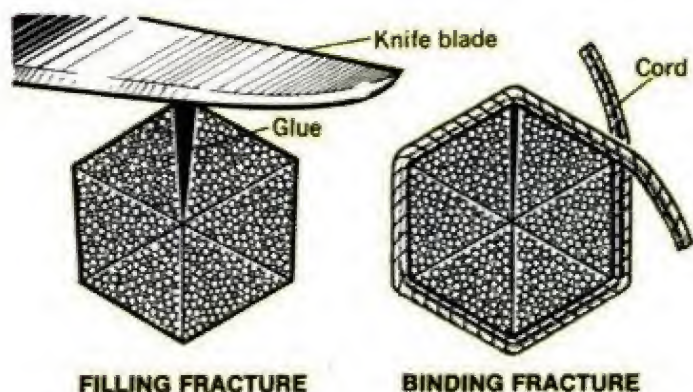
## How to save your discarded bait-casting reel, repair your rod guides and make a chum pot



**OLD BLEACH BOTTLES** have a number of uses among fishermen. Carefully cleaned and labeled, they serve as fuel cans and water bottles. Cut transversely and with their tops left on, they see duty as small boat bailers. Coastal anglers are familiar with "bleach buoys" marking crab and eel pots. For still another use, drill holes in the plastic side and attach a line to the handle. Fill the bottle with dog or cat food, crushed mussels or clams, or any other bait calculated to attract fish. For weight, put stones in with the bait, and, *shazam*, you have a chum pot! What's a chum pot? Why, it's the best way to get a feeding frenzy out of a sleepy fishing hole. The smell of food will awaken fishy appetites, and once you have the fish on the feed, you can keep them on it with slow but steady doles of bait bits or your chum pot which puts out a steady smell of goodness without actually feeding the fish. Try it. It works.

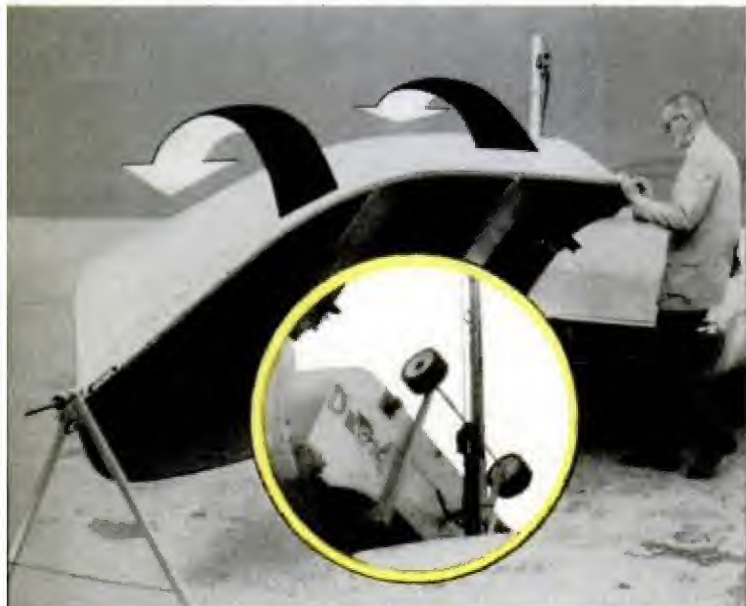


**IF YOUR BAMBOO ROD IS SPLIT**, and you'd like to restore it to use, spread the different sections as shown (left) and brace them open before setting the split end in a pot of warm glue. Soak a few minutes, and then remove. Tie the sections together as originally set, remove the excess glue, and let dry. If a bamboo rod has a single split section (below), scrape the break clean with a knife or razor. Then fill it with warm glue and bind until glue has completely hardened. Do not bind so tightly that you crack or split any other pieces.



# How to Cartop a Boat Without Suffering a Hernia

**SPEED IS APPEAL** of Deck inverting boat loader which has a loading and unloading time of 90 seconds for a 200-pound boat. For more information, write to Deck Marine Products, Lombard, Ill. 60181



**N**O MARINA COSTS, no ramp fees—and with take-anywhere, launch-anywhere capability, cartop boats are among the most versatile things afloat. My wife and I frequently tote a Sears 12-footer atop my Chevy II on weekend trips, and when we pass an interesting lake or inlet along the way, the car can be parked and the boat launched, all in a jiffy.

But increasingly longer, heavier boats are seen atop cars and vans these days. And while one man may manage a canoe or aluminum skiff all right, what about that 200 or even 300-pound 14 or 16-foot boat you want for greater freeboard and room? How do you get it down from the roof *and up again*, especially if you're by yourself? And how do you do it without denting car or boat? Here are several answers to the little agonies of cartopping.

—George Reiger, Boating Editor



**IDEAL FOR POPULAR NEW MINI-SAILERS** is the sailboat loader manufactured by the Cosom Corp., 6030 Wayzata Blvd., Minneapolis, Minn., 55416. It's available only in one size but it fits all standard trailer hitches. The unit consists of a 54-in. steel pole, dual-cushioned rests with central swivel and additional hardware which can be removed and stored in car trunk when not in use. Rust-resistant, \$40





**HOISTING A 300-POUNDER** atop your camping vehicle is easy with an Alone boat loader (Recreational Products Inc., 22025 Regnart Rd., Cupertino, Calif. 95014). Your cartop racks are used with special track, bow and transom wheels in a \$79.95 kit



**LOAD BOAT** sideways on this device and roll like a wheelbarrow to side of car where handle hooks lock into special cartop carriers. Grasp axle and lift. From Concord Marine, 4 Beharrell Street, West Concord, Mass. 01781



**HAUL YOUR CAMPER** and cartop your boat simultaneously with a Combo trailer hitch extender with offset (above) from Cosom Corp. Built of forged steel, the extender is a bar that lets trailer-hitch ball remain in a normal position. Price \$3. Other boat-loading and cartopping devices are made by Wesbar Stamping Corp., Box 577, West Bend, Wis. 53095, and by Market Forge, Everett, Mass. 02149



**ONE PERSON** can load or unload a 200-pound boat with Travelift (Box 182, Route 2, Osseo, Minn. 55368) made expressly for campers and motor homes. Device (left) can be installed in 15 minutes; does its job in 5. It raises inverted boat just above rooftop level with a winch. When proper altitude is reached, a walk around the back of vehicle swings boat into position for seating on roof carriers. Price: \$159

# Electronic Hints

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



**A LADY'S WIG HOLDER** makes a handy place to park a stereo headset when it's not in use. The plastic dummy adds a decorative touch and helps to protect the phones from damage. Holders are about \$3 at wig shops and hairdressers.—*Gregory S. Jensen, Clearfield, Utah*



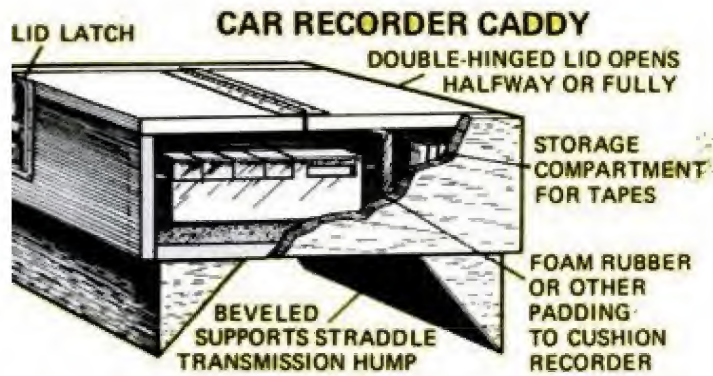
**IF YOU LIKE TO HEAR TAPES** while you drive but don't have a built-in car player, you can make your own mount for a portable cassette recorder like the one shown here. Made from scrap wood, it rests on beveled cleats that straddle the transmission hump alongside the



**USE A LAPPED SPLICE** to join TV lead-in and it won't flex and break the way end-to-end splices do. Bare the wires, leaving an inch of insulation protruding. Cut notches in insulation, as above. Overlap ends, twist wires together and tape. The notches give tape a strong grip, making a rigid joint that can't pull apart.—*Russell Walker, Trenton, Ont., Canada*



**YOU CAN SAVE MONEY** on small-reel recorders by buying tape in big 7-inch reels and winding it onto your own spools. Support the large reels on a screwdriver held upside down and use the recorder's rewind for fast loading of small reels.—*James Tallon, Phoenix, Ariz.*



driver's seat, putting the recorder within easy reach. The split lid opens halfway for operating the controls or all the way for switching tapes or removing the machine. You can shape and space the cleats to fit your particular car.—*John F. Dinges, Homewood, Ill.*



**REMOVING DIRT** from delicate electronic gear is easy with this adapter for a vacuum cleaner. Drill out a large-size cork to take  $\frac{1}{4}$ -inch rubber tubing, then force the cork into the cleaner's nozzle (top photo). A large drinking straw slipped into the tubing (bottom) makes a good cleaning "wand" for work in close quarters.—*Herbert Y. Moon, Cutchogue, N.Y.*



**TEST BENCH ORGANIZER** stores electronic instruments and small parts in one handy work center. Raised above bench level, the instruments are easier to operate. Hardboard shelves in grooves hold plastic parts boxes in neat rows. Stop strips keep the boxes from being pushed too far in. At one end are power outlets and coaxial antenna connectors. The plywood cabinet is  $5\frac{1}{2}$  inches high. Make length and depth to suit your own test gear.—*Marshall Lincoln, Wickenburg, Ariz.*





# Good

Just watch the needle, and this easy-to-make meter will tell you instantly whether your stereo speakers are properly balanced for maximum listening enjoyment

By R. BLOCH

Technical Illustrations by Fred L. Wolff

**G**OOD STEREO requires careful balancing of the two speakers so you get exactly the right amount of each signal. Merely centering the balance control on the amplifier won't guarantee that the speakers are actually delivering equal output. Nor does balancing by ear insure a perfect result because room acoustics and speaker placement can fool your ears.

This handy meter tells you electronically whether your speakers are balanced so there's never any doubt. It's easy to use because there's only one needle to watch. With conventional output-measuring meters, you either have to compare two needles until you get identical readings on both channels or you have to switch one meter back and forth between the two channels until it reads the same for both.

The stereo balancer shown here indicates the condition of both channels simultaneously on a single meter. Instead of measuring individual channel output, it records the *difference* between the two channels. If the left channel is stronger than the right, the meter needle swings to the left. If the right channel is stronger, the needle moves the opposite way. You simply adjust the balance control until the needle centers, indicating that both channels are exactly equal in output. As a bonus, the meter will also check your tone controls and speaker phasing.

At the heart of the balancer is a dual-reading 100-0-100 microammeter.

POPULAR MECHANICS

# Stereo at a Glance

## WHAT THE METER TELLS YOU



LEFT CHANNEL  
TOO STRONG



BOTH CHANNELS  
EVENLY BALANCED



RIGHT CHANNEL  
TOO STRONG

IF METER NEEDLE SWINGS to the left or right, it indicates one speaker is stronger than the other, spoiling your stereo effect. Speakers are properly balanced when needle centers. Make check periodically

ter. The one used here is a trim little edgewise panel meter available for about \$3 from Lafayette Radio, 111 Jericho Turnpike, Syosset, N. Y. 11791. No power supply is required since the meter is powered by the stereo signal itself. There are only three connections to make to your hi-fi set—one to the left speaker hot terminal, one to the right speaker hot terminal and one to the common or ground terminal for both speakers. The meter can be left permanently connected since it's controlled by a pushbutton switch. To take a reading, you just hold the button down while adjusting the balance control. The switch keeps the meter shut off when it isn't needed, thus saving wear on its delicate parts.

The signals from the left and right speaker channels are fed to two miniature 100K:1K audio transformers, T1 and T2, also available from Lafayette Radio. These are wired backward to serve as step-up transformers, giving a 10 times boost in voltage for greater meter sensitivity. The 1K secondaries are connected to the inputs from the speaker terminals on the amplifier and the 100K primaries are connected to transistor Q1 and the microammeter. Be sure to order these particular transformers and follow the color coding indicated in the wiring diagrams for easy hookup of their leads. If you should use other transformers with different color coding, remember that they're wired in reverse with the secondaries on the input side and the primaries on the output side.

In effect, the transformers are connected in series and it's this unique arrangement that gives the balancer its simplicity. The output of transformer T1 is

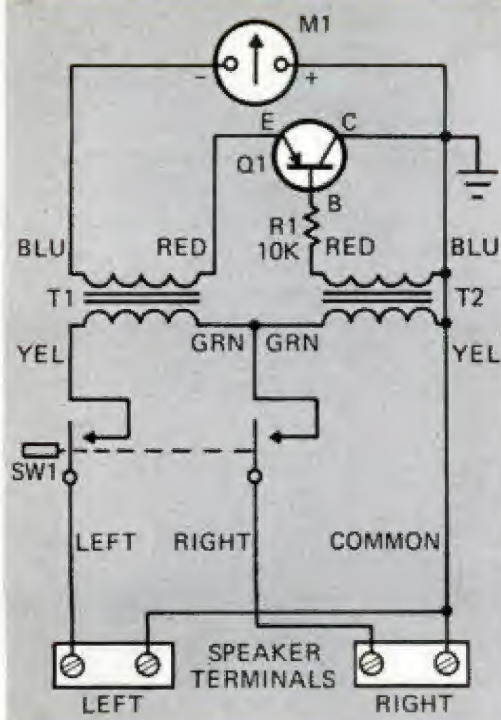
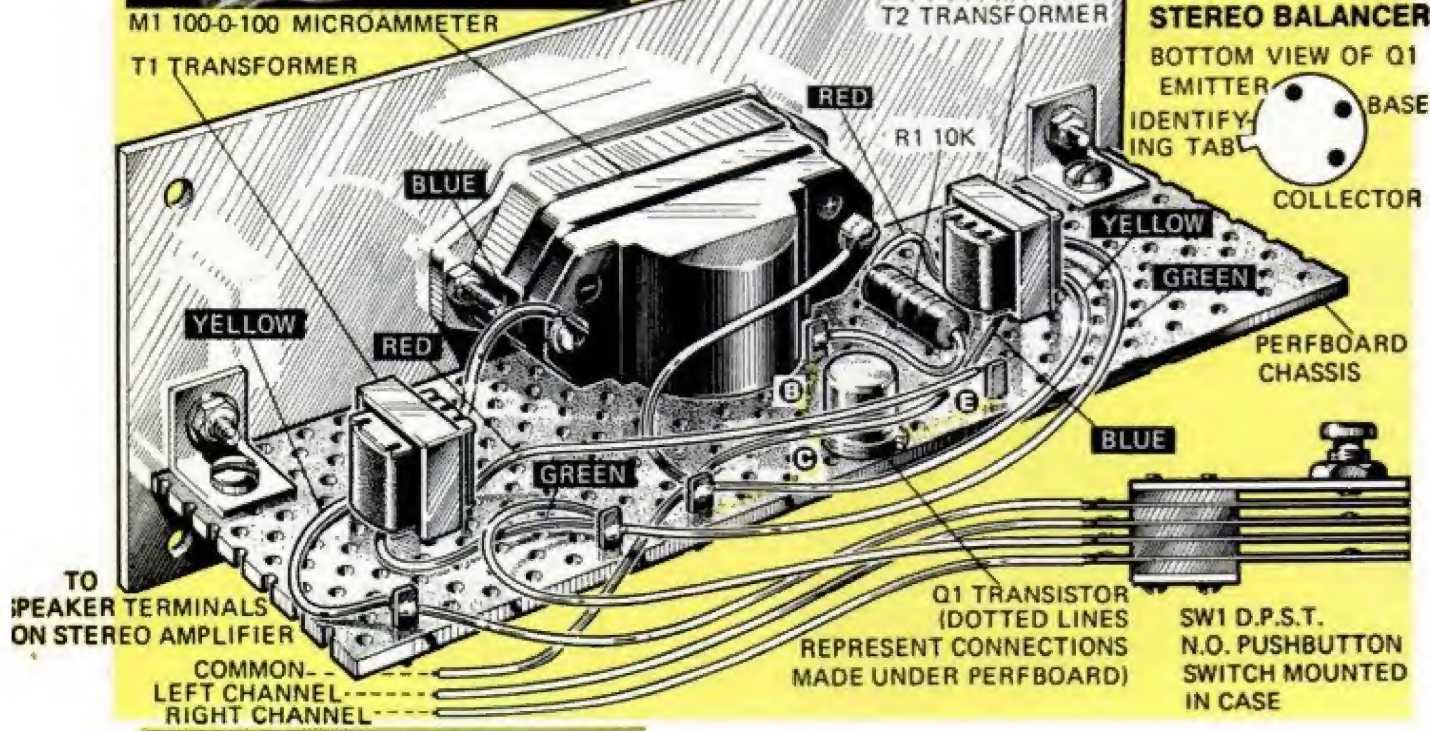
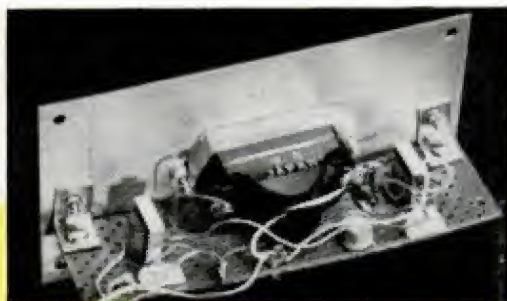
a difference signal representing the right channel minus the left channel. Transformer T2 provides the right channel signal only. Current polarity is determined by the relative strengths of the two right and left channel signals. If it's positive, the meter needle swings one way; if negative, the needle swings the other way. This indicates which channel is the dominant one. When both channels are exactly equal in strength, the transistor does not conduct, no current flows to the meter, and the needle remains centered.

The transistor is an RCA germanium type PNP 2N1303 (also Motorola HEP 629). Because its operation is fairly critical, it's best not to make substitutes. RCA and Motorola transistors are available at most radio-parts stores. If you have difficulty finding the proper type locally, it can be obtained by mail from Inventive Electronics Corp., Wykagyl Station, N. Y. 10804. Price is \$2.50 postpaid.

The parts are housed in a small Bakelite case, 1½x2½x5 inches, with an aluminum front panel. Cut a 1½x9/16-inch rectangular opening in the center of the panel for the meter. The pushbutton switch is mounted in the side of the case. The transformers and other components are laid out on a strip of perforated phenolic board attached to the front panel with angle brackets. Use flea clips inserted in the perfboard's holes to facilitate the wiring. All connections are made on top of the board except for those to the transistor's leads, which extend below the board. Use pliers or a heat-sink tool on the leads during soldering to avoid damage to the transistor from excessive heat.

To use the balancer, adjust the amplifier

SMALL PIECE OF PERFBOARD mounted on inside of box cover serves as chassis. All connections are made on top except for those to the transistor leads underneath, shown in dotted lines. Follow color coding on transformer wires carefully



- PARTS LIST**
- Q1—PNP germanium transistor RCA type 2N1303
  - T1, T2—1K:100K transformers (Lafayette Radio 99F61251)
  - R1—10K, 1/2-w. resistor ±20%
  - SW1—D.p.s.t. normally open pushbutton switch (Lafayette Radio 30F41142)
  - M1—100-0-100 microammeter (Lafayette Radio 99F50346)

controls until the two speakers seem nearly equal in output, then press the button to take a reading. If the meter needle deflects one way or the other, touch up the balance control until it centers.

In the same way, you can also check out your bass and treble tone controls to insure that they are affecting both channels equally. If one channel has more bass or treble than the other channel, it will show up on the meter in the same way as for unequal channel output. Start with the concentric knobs aligned and turn the controls up and down, taking readings at various points along the way. If the controls are tracking properly, you should get zero-deflection readings along the whole scale. If you don't, adjust the separate knobs for minimum deflection. If you can't get the controls to track perfectly over the full range, adjust them for zero deflection at the points where you customarily keep them set. This will give you good balance at the normal listening positions.

If your stereo system has a phase switch, it, too, can be checked quickly with the meter. Simply flip the switch one way, then the other, noting the meter readings. When the speakers are out of phase, the needle will deflect; in phase, it will center. To avoid harming the meter, take all readings at moderate volume levels. At extreme volume, it's possible to exceed the transistor's 30-volt breakdown rating and destroy the part. ★★★

# NEW FOR YOUR CAR



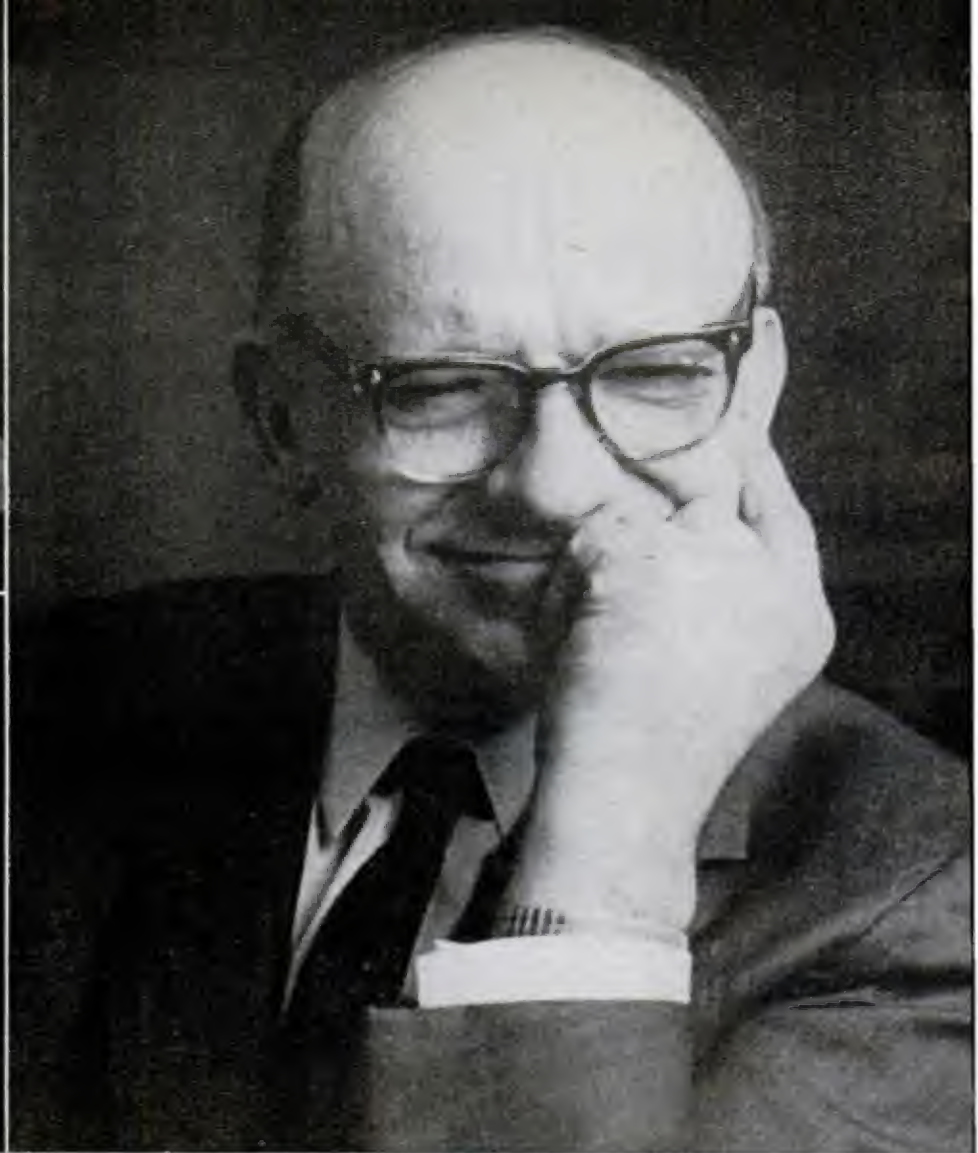
**YOU CAN WEATHERPROOF** an open pickup truck with a trim, plastic cargo cover made to protect camping gear and other supplies that must be kept dry. For loading and unloading, the cover tilts up at the rear and is supported on adjustable arms. For tall loads, it can be raised on brackets, as shown at lower left, to provide greater height clearance. In the lowered position, it fits snugly over the cargo bed's sides to seal out rain and dirt. The covers come in several sizes and styles for recent-model Ford, Chevy, Dodge, International and GMC pickups. Prices range from \$159 to \$199. Ponca Products, Inc., Box 1896, Ponca City, Okla.

**TAPED INSTRUCTIONS** tell you how to tune up your car—just follow the steps as you listen. The tape can be played on any cassette machine and covers such jobs as regapping sparkplugs, replacing points, checking timing and making carburetor adjustments. Included with the tape is a diagram of engine parts for easy identification. Tapes are for VWs, Porsches, Volvos, Opels, BMWs and Mavericks, with 22 more to come. \$9.95 each. Coursette System, Inc., 104 Fifth Ave., New York, N.Y.



**TWO-WAY CAR SEAT** is designed to protect small-fry motorists in a crash. It's anchored in place by a regular seat belt looped over the frame. An upward-curving pad in front cushions impact and prevents the child from being thrown out. Removed from the car, the seat can be turned around and used as a handy booster chair in restaurants, with the crash pad serving as a backrest. Made by Hamill Mfg. Co., a division of Firestone Tire & Rubber Co., 1200 Firestone Pkwy., Akron, Ohio. \$18.95.





# Shoot Portraits With a

**This simple setup using an old umbrella gives you soft bounce lighting from a normally harsh flash** By EDWIN HITTIG

**I**F YOU THINK portrait photography requires a lot of fancy equipment and complicated setups, forget it. It doesn't have to. You can shoot excellent informal portraits with a single light—even a flash. The trick is to bounce the flash off a curved reflector. This softens the light and spreads it out to flood your subject evenly without hot spots and harsh shadows. There's no squinting and squirming under glaring floodlights, and you don't have to change the setup every time your subject moves. It remains basically the same.

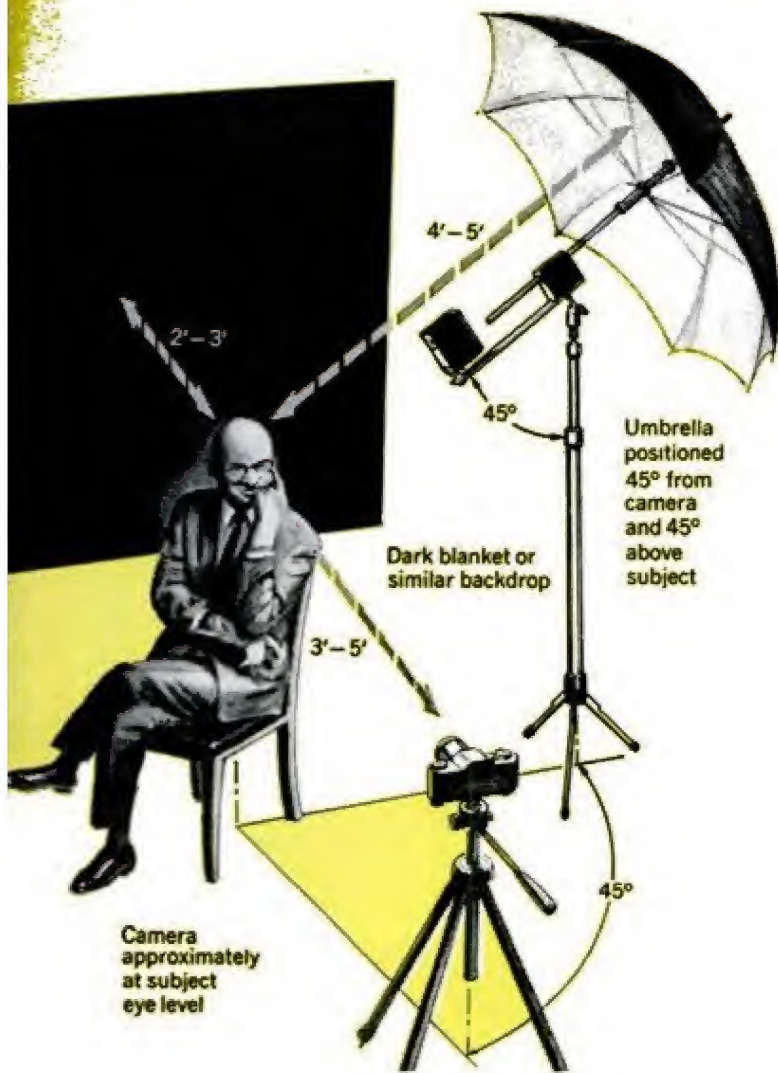
The method works best with electronic flash, but you can also try other light sources, such as flashbulbs, movie lights and photofloods. An old umbrella, sprayed

white inside, makes a perfect reflector. It can be supported in several ways depending on how elaborate you want to get. The bracket shown is easy to make and holds the umbrella shaft at one end with the handle cut off. The flash slips into an accessory flash shoe clip at the other end, aimed at the center of the umbrella.

For a quicker dodge, you can leave the umbrella handle attached and simply tape the flashgun to it. The umbrella can then be taped or clamped to a pole, tripod, stepladder, standing lamp or other convenient support. Positioning the rig is easy. It's the old classic 45/45 arrangement—45° from the camera horizontally and 45° above your subject vertically.

Use a dark wall or blanket as a back-



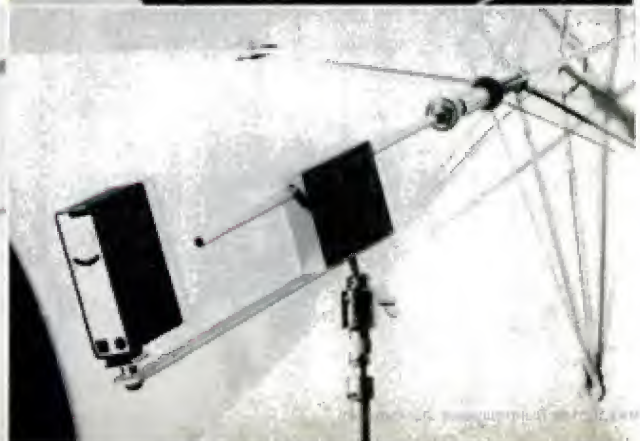
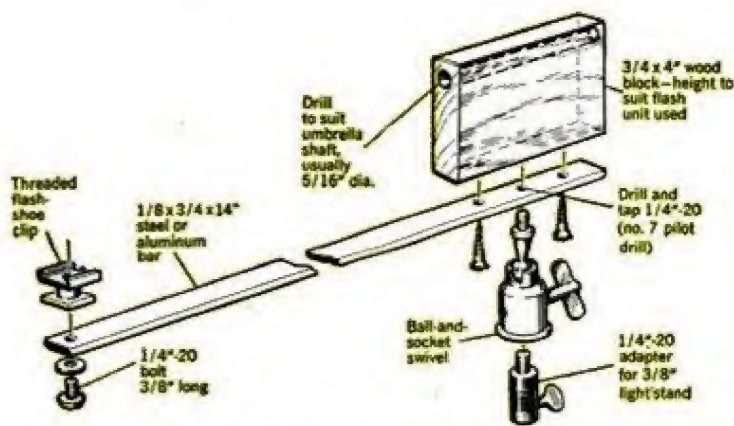


drop and keep your subject two to three feet in front so light won't spill onto it. This will give you a crisp, black background with your subject lighted dramatically in the foreground. To connect the flash, you'll need an extension sync cord six to eight feet long.

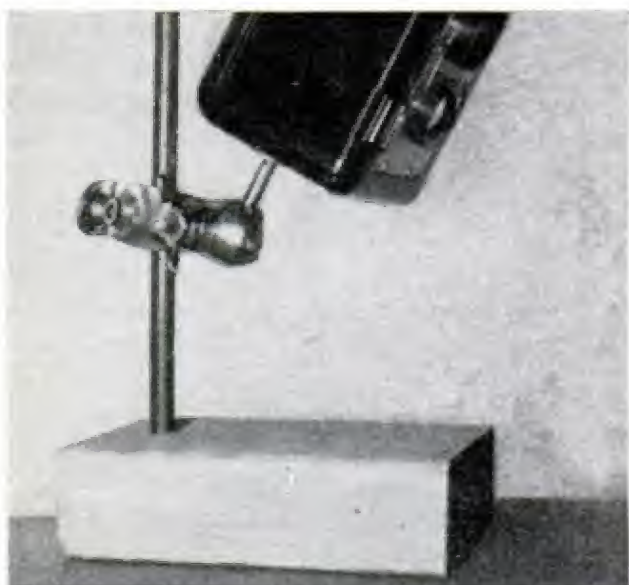
Exposures are calculated on the basis of flash-to-subject distance in the same way as for regular flash shooting except that you must compensate a bit for light lost in the bounce process. Total flash-to-subject distance is the distance from the flash to the umbrella, plus that from the umbrella to the subject. Divide this into the guide number for your flash to find the correct f/stop, then open up one stop wider to give the necessary added exposure. Experiment with different distances and exposures until you find the best combination. Once you establish this, you can shoot just about any type of portrait with the same setup and the results will always be identical. ★★★

# Single Light

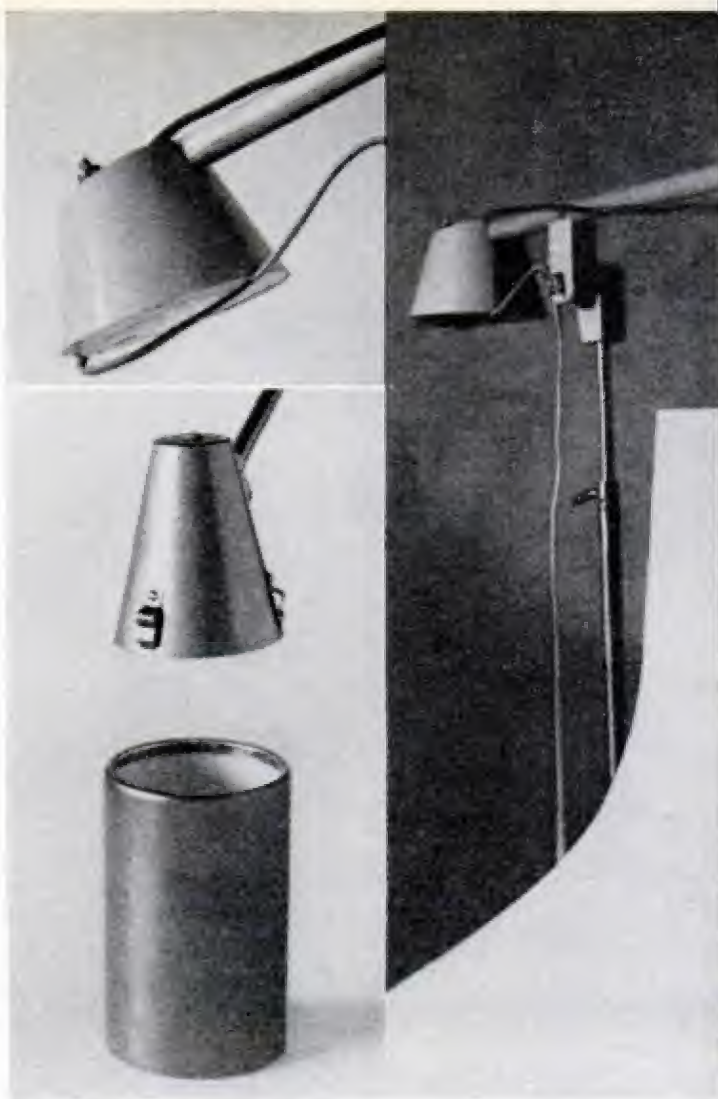
**HOMEMADE BRACKET** shown below holds umbrella shaft in wood block with flashgun in accessory flash shoe clip. Block allows umbrella to slide back and forth to adjust distance to flash. Rig mounts on light stand with ball-and-socket swivel and adapter fitting. Swivel, adapter and flash clip are stock photo accessories. At lower left is alternate mounting arrangement using photographic clamp. Spray umbrella with several coats of white enamel to give good reflectance



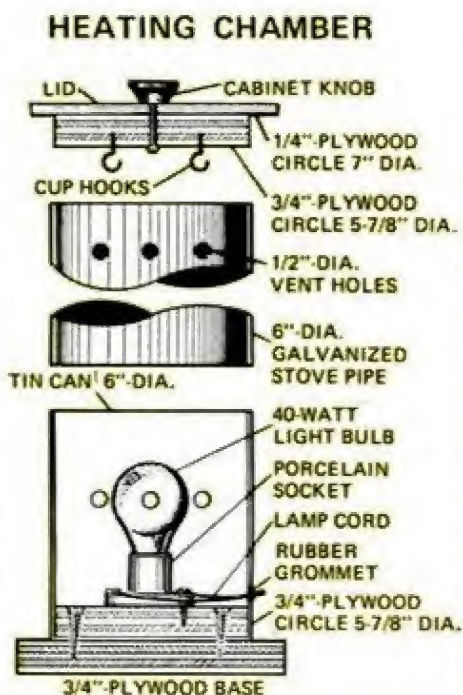
# PHOTO HINTS



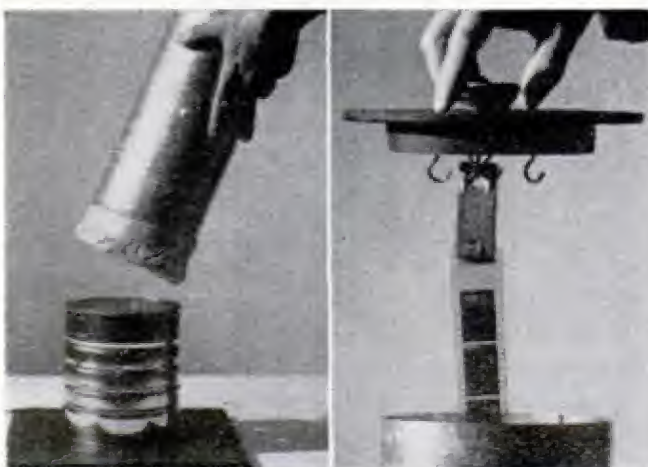
**A HANDY CAMERA STAND** for tabletop photography can be made from a  $\frac{3}{8}$ -inch hardwood dowel or steel rod inserted in a two-by-four block. Use a ball-and-socket swivel with a clamp at one end and attach this to the upright. The swivel screws into the camera's tripod socket and lets you work at any desired height or angle.—H. N. Webster, Nutley, N.J.



**MINIATURE BOOM LIGHT** for small objects can be made from a high-intensity desk lamp. Remove the lamp arm and fit it into a  $\frac{5}{8}$  or  $\frac{3}{4}$ -inch dowel. Feed the wires out a cross hole. Attach the base to the other end of the dowel with screws or bolts to act as a counterweight. The boom pivots on two



**SIMPLE FILM DRYER** using a 40-watt light bulb will dry negative strips dust-free in half an hour. The base is a one-gallon tin can and the chimney is a two-foot length of six-inch galvanized stovepipe. Drill  $\frac{1}{2}$ -inch holes around the can and the top of the pipe. Air



drawn in at the bottom is heated by the bulb and rises through filtering cloth to dry the film. For a filter, use a lint-free material like cheesecloth or muslin and fasten it around the lower end of the pipe before inserting the pipe in the can.—M. S. Schroeder, Cary, Ill.

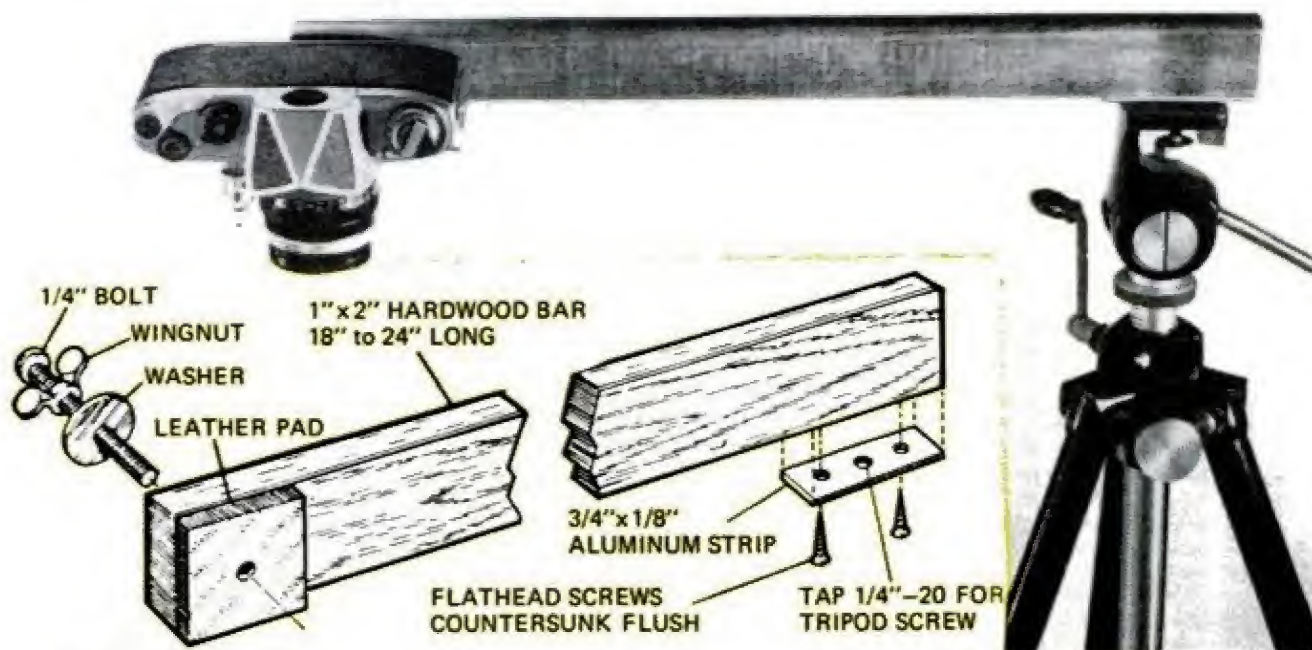


small blocks joined with a bolt and wingnut. Screw one block to the dowel at the balance point and drill the other to slip on a light stand. A hood for spotlighting is made from a small can. Bend three clips from springy metal and fasten them to the lamp's shade to grip the can.—*R. S. Hedin, Minneapolis*



**ADD A SHUTTER RELEASE** to your accessory camera grip and you can free one hand for focusing or holding a flashgun. Bend a strip of metal into a U-shaped clamp to hold the release cable and bolt it to the hand grip where your finger can reach the plunger easily. Pad the cable with a thin strip of cork or leather.—*R. S. Hedin, Minneapolis*

**YOU CAN CONVERT A TRIPOD** for overhead shooting or copying work with this extension arm. It's attached by means of a metal plate drilled and tapped to fit the 1/4-20 tripod screw. A 1/4-20 bolt clamps the camera to the outer end. A wingnut permits fast tightening and loosening.—*Norman Fallon, New York*



# How to Service Small Engines

By MORT SCHULTZ

**LOOSE CARBURETOR BOLTS** allow air to lean out the fuel mixture, often the cause of hard starting

**N**OW COMES the challenge. As we said last month, you must first isolate a small engine problem to the fuel or ignition system, or to compression failure. Then, fix it!

This article outlines the order in which to make repairs. Since engines vary, you'll have to choose the advice that applies to yours.

Luckily, most malfunctions can be fixed with a simple repair. If a repair is beyond your experience or you lack the proper tools, you should seek the services of a small-engine repair shop. But before you do anything else, make sure the spark-plug is in good shape and gapped properly, as explained last month. You may not have to make any further repairs.

## Failure to start or hard starting

If this occurs because fuel is not getting to the engine:

- *Is there fuel in the tank?*
- *Do you follow maker's instructions when starting the engine?*
- *Is fuel contaminated?* Drain an eye-dropper amount from the tank and drop it into your hand. If water or dirt remains after the fuel evaporates, remove the fuel tank, dump old fuel, and slosh the tank clean with kerosene.

Naturally, oil in the fuel mixture of two-cycle engines won't evaporate. But

if water is present, there will be droplets in the oil after gas evaporates. If dirt is present, oil feels gritty as you rub it between your fingers.

Never use last year's fuel in yard and garden equipment. It may not vaporize and could leave varnish on carburetor parts. Avoid trouble—always fill the tank with fresh fuel.

- *Is the fuel line damaged?* Replace one that's kinked. Remove the line and blow through it. If it's obstructed, clean it out or get a new one.

- *Is air leaking into the fuel system because of loose bolts?* Tighten all carburetor mounting bolts and fuel line connections.

- *Does the choke plate fail to close fully as you start the engine?* Then clean dirt from around the plate and shaft with a carburetor cleaning solvent. Make sure that the choke cable, if there is one, is neither kinked nor broken.

Some model engines, such as the Briggs & Stratton 92000, built since August 1968, and Wisconsin's ACN and BKN, feature an automatic choke. The B & S system is fully automatic. With the Wisconsin setup, you must close the choke plate by hand, but it opens by itself when the engine starts.

If the choke plates of these don't function properly, and dirt around the plate

## PART 2: REPAIRS

**Most repairs are simple—call for little more than adjustment or replacement of parts. Here's what to do when your engine is hard to start, overheats, tends to stall, misses, surges, backfires, vibrates or knocks . . .**



*Technical Illustrations by Fred L. Wolff*

**SIMPLE CLEANING** of the choke plate and carburetor linkage with solvent often solves hard starting

isn't the cause, dismantle the carburetor to get at choke parts for cleaning or replacement.

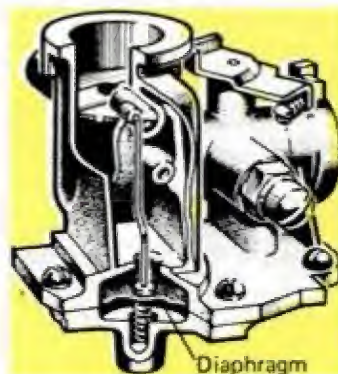
● *Is the fuel filter clogged, obstructing fuel flow?* Engines that employ float-type carburetors generally have a wire-mesh screen fuel filter in the tank-to-fuel line adapter. Remove it by unscrewing the adapter and wash it in gasoline.

On large engines, the standard filter is a sediment bowl which houses a ceramic element. Shut off the fuel valve, drop and clean the bowl and swish the element in clean gasoline.

● *Is the fuel pump shot?* If your engine has a fuel pump, which it will if it doesn't have a gravity-feed fuel system, it can be either a mechanical type that works off an eccentric on the engine crankshaft or a diaphragm type that operates in relation to engine vacuum. However, mechanical pumps also have diaphragms.

Fuel pumps are usually found on the fuel line between fuel tank and carburetor. Usually because engines with diaphragm carburetors have the fuel pump built into the carburetor. You can't see the diaphragm element unless the carburetor comes off, which is what has to happen if you suspect fuel-pump failure. The fuel pump isn't suspect often, because trouble isn't common—that's why it's tough to find when it does crop up.

Pumps fail mainly when bolts work



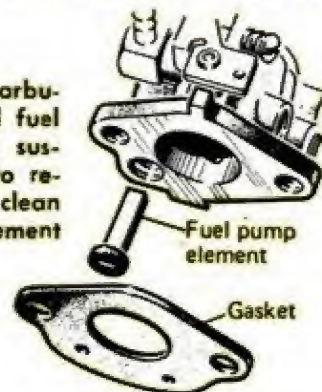
**BRIGGS & Stratton 92000 and Wisconsin ACN and BKN engines have automatic choke. B&S carburetor (left) has diaphragm inside. Carb must be taken apart to clean or replace parts**

**SEDIMENT BOWL** is a commonly used filter. It contains a ceramic element. All of the parts can be cleaned and re-used, including the ceramic element



**SHUTOFF ADAPTER**, such as that shown at left, contains a wire mesh filter that must be cleaned. This type of a filter is mostly found in use with float-type carburetors

**LAUSON-TECUMSEH** carburetor has an internal fuel pump. If trouble is suspected, you'll have to remove the carburetor, clean cavity, replace element





**EXTERNAL FUEL PUMP** "failure" may not be that. First tighten the bolts which may be admitting air



**ENGINE FLOODING** can often be traced to a dirty air cleaner. Dirty filters will shorten engine life



**A STUCK NEEDLE VALVE** can often be loosened by tapping on the carburetor bowl with a screwdriver



loose, and the pump starts to pull in air that leaks out the fuel mixture. Pump diaphragms can develop leaks, but they don't normally fail immediately to the point where they stop pulsating, which would keep the engine from starting. Rather, an engine with a faulty fuel-pump diaphragm will stall when revved up as a result of an insufficient delivery of fuel at higher speeds. Replace the diaphragm. Once the cover comes off, replace the gasket with a new one.

● *What about the carburetor?* If you haven't yet discovered why the engine is starving for fuel, it's the carburetor—dirt-clogged parts or passages. Disassemble and clean it thoroughly in carburetor solvent. The task is easy enough with proper instructions from the manufacturer of your engine; give him the engine's model and serial number. They're on the nameplate.

The fuel system can keep the engine from starting by flooding it. Check:

1. *Does the choke open fully as soon as the engine starts?* If not, repair as described above.

2. *Is engine flooding caused by a dirty air cleaner?* This is common and should be checked before you start twirling carburetor adjustment screws. Here are seven common types of air-cleaner elements used on small engines:

**Polyurethane.** Wash in detergent solution, and oil it with SAE 30 motor oil.

**Paper.** Replace.

**Oil bath.** Dump old oil, clean in kerosene, and add fresh oil.

**Aluminum foil.** Wash in kerosene.

**Felt.** Wash in soapy water.

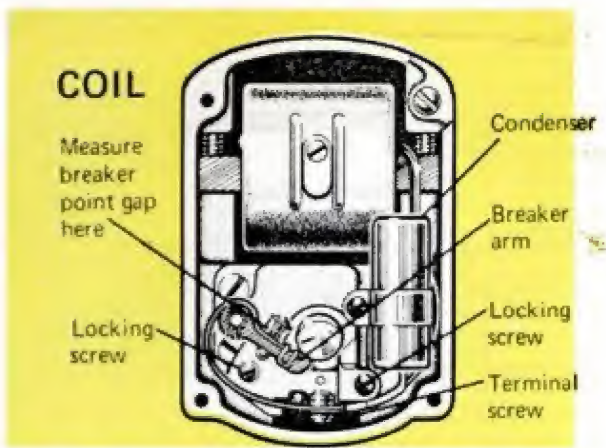
**Metal cartridge.** Tap lightly to loosen dirt. If very dirty, replace.

**Fiber.** Blow dirt out with compressed air.

3. *Is dirt holding the needle valve open?* This would be indicated if fuel drips from the carburetor. Consider this if you have a float-type carburetor. Often, tapping the bowl lightly with a screwdriver handle will remedy the problem. If not, dismantle and clean the carburetor.

4. *Is the carburetor out of adjustment?* Specific adjustment details will have to be

**TO ADJUST IDLE SPEED,** back out screw, turn it until it touches throttle lever; then add full turn



**BREAKER POINTS** in a box on large Wisconsin and Kohler engines are quite easy to adjust or repair

obtained from the manufacturer. Meanwhile, an approximate adjustment can be made, assuming that the carburetor doesn't have fixed main-mixture and idle-mixture jets.

To adjust the main-mixture and idle-mixture needles, turn them in until they are finger-tight—then back out one turn. To adjust the idle speed, back out the screw and then turn it until it just touches the throttle lever. Continue for one full turn more.

● *Ignition failure?* If the engine doesn't start because of ignition failure, the reason is usually a bad sparkplug or breaker points (assuming you don't have solid state ignition). Often the job of getting at the points is a major obstacle to ignition repair.

There's no sweat if you have external breaker points which are kept in a box attached to the engine and are revealed by removing a cover. Larger engines, such as those made by Wisconsin and Kohler, use external breaker points as part of an ignition coil system.

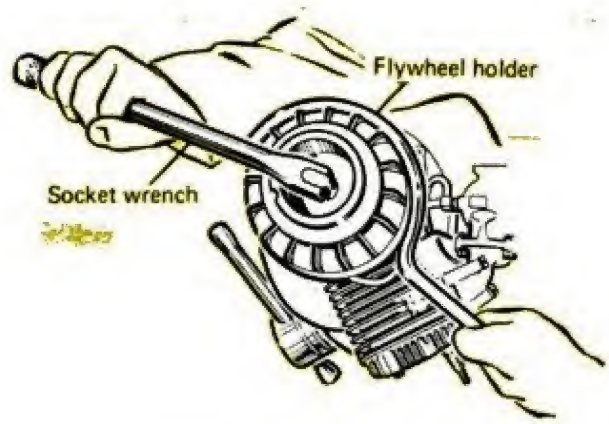
If breaker points are internal—that is, beneath the flywheel as in magneto ignition systems—the problem is to remove the flywheel. Before going to this trouble, make sure that the cause of ignition failure isn't some minor thing, such as the engine stop device being in the "off" position, a weak battery (self-start units), or a wet sparkplug cable.

The way you remove the flywheel depends on which one the engine has. There are two general methods.

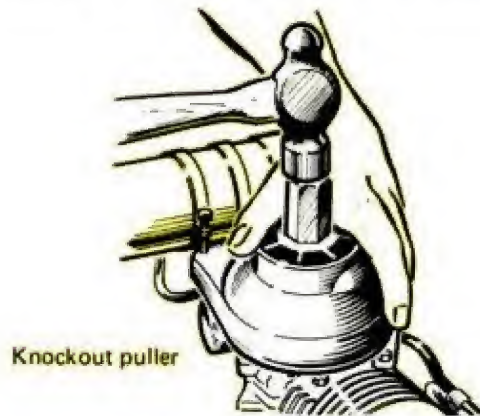
The flywheel nut on most two-cycle

**WITH FLYWHEEL REMOVED,** breaker points are accessible for replacement or adjustment to .020 in.

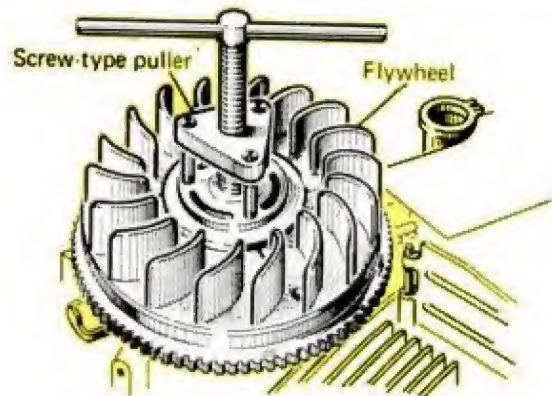
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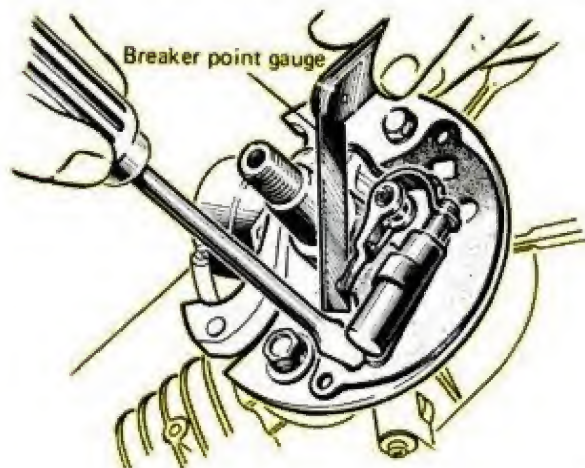
**FLYWHEEL NUT** can be removed with socket wrench, but you may need the flywheel holder shown here



**KNOCKOUT PULLER** is used after nut is removed. Rapping puller with a hammer jars the wheel loose



**FLYWHEEL PULLER** is generally used on engines of 3½ hp or larger which have holes provided for it





**OVERHEATING**, especially of mower engines, often is caused by a buildup of dirt, clippings on fins

engines (you have to determine whether it has a left or right-hand thread) can be removed with a socket wrench. If the nut proves stubborn, rap the wrench bar with a soft hammer. If the flywheel turns as the nut is being removed, hold it with a flywheel holder.

Flywheels of most four-cycle engines must be held with a flywheel holder as the nut is removed. With the nut off, you now have to remove the flywheel. On some, you install a knockout puller, hold the flywheel firmly, and rap the puller with a hammer to jar the flywheel loose. This is generally done on engines smaller than 3½ hp.

Other flywheels—those having holes in them for the purpose—are removed with a flywheel puller. This method is generally used on engines of 3½ hp or larger.

Check all ignition leads for tightness and cleanliness. Make sure that no high-tension wire is shorting out.

Examine breaker points, and replace them if burned or pitted. If frequent replacement is necessary, the condenser is faulty. Replace it.

Check point gap. The correct gap in most cases is .020 inch, but verify this with your owner's manual.

If the ignition system now fails to produce spark, all ignition parts, such as coils, condenser and magnets, should be tested on an analyzer, and ignition timing adjusted to specification.

● **Compression failure?** This is caused most often by a problem that requires major engine overhaul, such as a scored cylinder, sticking piston rings, sticking valves, or defective crankshaft oil seals.

However, before going into the engine, listen carefully as you crank it.

If you hear a hissing noise, check the sparkplug for looseness or damage. The hiss could be caused by the fuel mixture escaping from around a loose or bad plug. If the plug is okay, then the hissing is coming from a loose cylinder head or cylinder head gasket.

### Engine overheats

Check the following in this order:

1. *Is the engine being used for a purpose it's not designed for and, thus, being overloaded?*

2. *If a four-cycle engine, is the crankcase filled with oil? If a two-cycle engine, are you using the oil-gas mixture specified by the manufacturer? If not, you're asking for trouble. There is no other cause of two-cycle engine malfunctioning that outranks improper fuel mixture.*

Are you using the oil specified by the manufacturer? In most cases, oil designed for outboard motors should never be used. It thickens to the consistency of grease when hot. Use the right oil and a regular grade of gasoline marketed by a well-known company.

3. *Is airflow obstructed? Are cooling fins clogged? Your engine must breathe. Make sure nothing stops that.*

4. *Is the carburetor set too lean?*

5. *Is ignition timing off?* Timing of small engines is not extremely critical and will be maintained if breaker points are kept clean and properly gapped. Exact timing requires a special timing gauge.

6. If all else up to now has failed to overcome overheating then there is probably a buildup of carbon in the combus-



**CYLINDER-HEAD BOLTS** should be tightened often to prevent head cracks and leaks in compression

POPULAR MECHANICS



tion chamber which needs to be cleaned out.

### Engine cuts out while running

Here are the causes (the method of repair, in most cases, is dealt with above):

1. Out of fuel.
2. Contaminated fuel.
3. Excessive engine heat on the fuel line which is causing a vapor lock condition. Pour cold water over the fuel line and carburetor, but don't get any into the carburetor. Make sure that nothing is obstructing air-flow and that cooling fins are clear.

4. Is the vent hole in the fuel tank cap clear? Clean it out with a piece of wire of proper size, but take care not to enlarge the hole.

5. Ignition failure.

### Engine misses

Reasons for this are:

1. Contaminated fuel.
2. Sparkplug gap too wide or plug is damaged.
3. Loose ignition wires.
4. Pitted or worn breaker points.
5. Compression failure.

### Engine surges (gallops)

Look for these things:

1. Plugged vent hole in fuel-tank cap.
2. Carburetor flooding. Maybe the throttle linkage is dirty and sticking. Clean it with carburetor solvent and lubricate with a thin coating of white grease. If this isn't the cause, go back to the section that deals with flooding.
3. Governor parts sticking. Clean dirt off linkages.

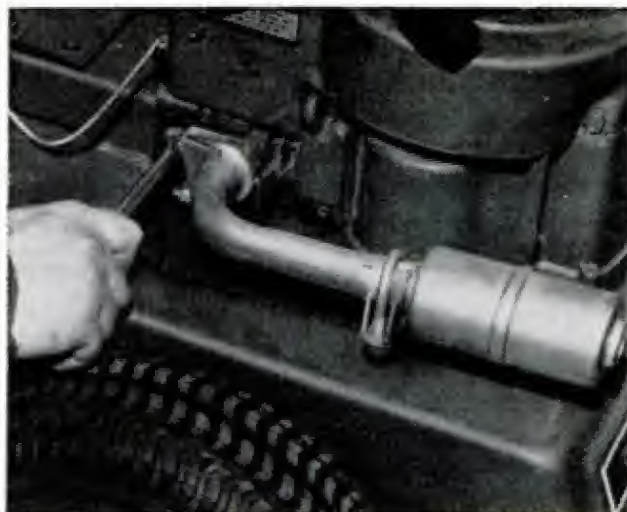
### Engine backfires

1. Contaminated fuel.
2. Fuel mixture too lean.
3. Timing not to specifications.
4. If nothing so far, you've got a sticking valve condition.

### Engine vibrates excessively

Vibration in small engines is always present. However, it becomes serious when it causes mounting bolts to loosen which, in turn, lead to greater vibration that can eventually result in major damage.

Tighten up on all bolts and fasteners—this should be done periodically anyway. If vibration isn't lessened by this, then



**EXCESSIVE VIBRATION**, often due to loose mounting bolts, may cause the muffer hangers to loosen

check the balance of associated equipment, such as mower blades. If vibration is still troublesome, then suspect a bent crankshaft.

### Engine knock

If checks for overheating and contaminated fuel don't relieve engine knock, do the following:

1. Make sure that timing isn't overadvanced.
2. Make sure the flywheel is tight.
3. Remove the cylinder head and clean carbon from the head and piston crown.
4. Last, do an engine overhaul. You have a bad connecting rod.

### Maintenance

Periodic care of small engines is much easier than making repairs. Your owner's manual spells out what should be done to keep your engine in good running shape. To emphasize the most important points, though, here is a maintenance schedule you can use:

1. Check the oil level of a four-cycle engine every time you run it.
2. Clean out engine shrouds and exhaust ports before every use.
3. Change the oil of four-cycle engines with the proper grade and weight every 25 hours of operation.
4. Tighten all body bolts and fasteners every 25 hours.
5. Clean or replace the air filter every 50 hours. However, clean oil-bath air-filter systems every 25 hours.
6. Clean fuel filter every 100 hours of operation.
7. Service the sparkplug and breaker points every 100 hours.

★ ★ ★

# ALL-TIME GREAT NO. 5

## Build This Old-Time Yard Swing

Great projects never die, but sometimes we forget how popular they were. This one, first a hit with readers in 1918, will find new favor in 1971

By WAYNE C. LECKEY, Home and Shop Editor

Color Photo by Robert D. Borst

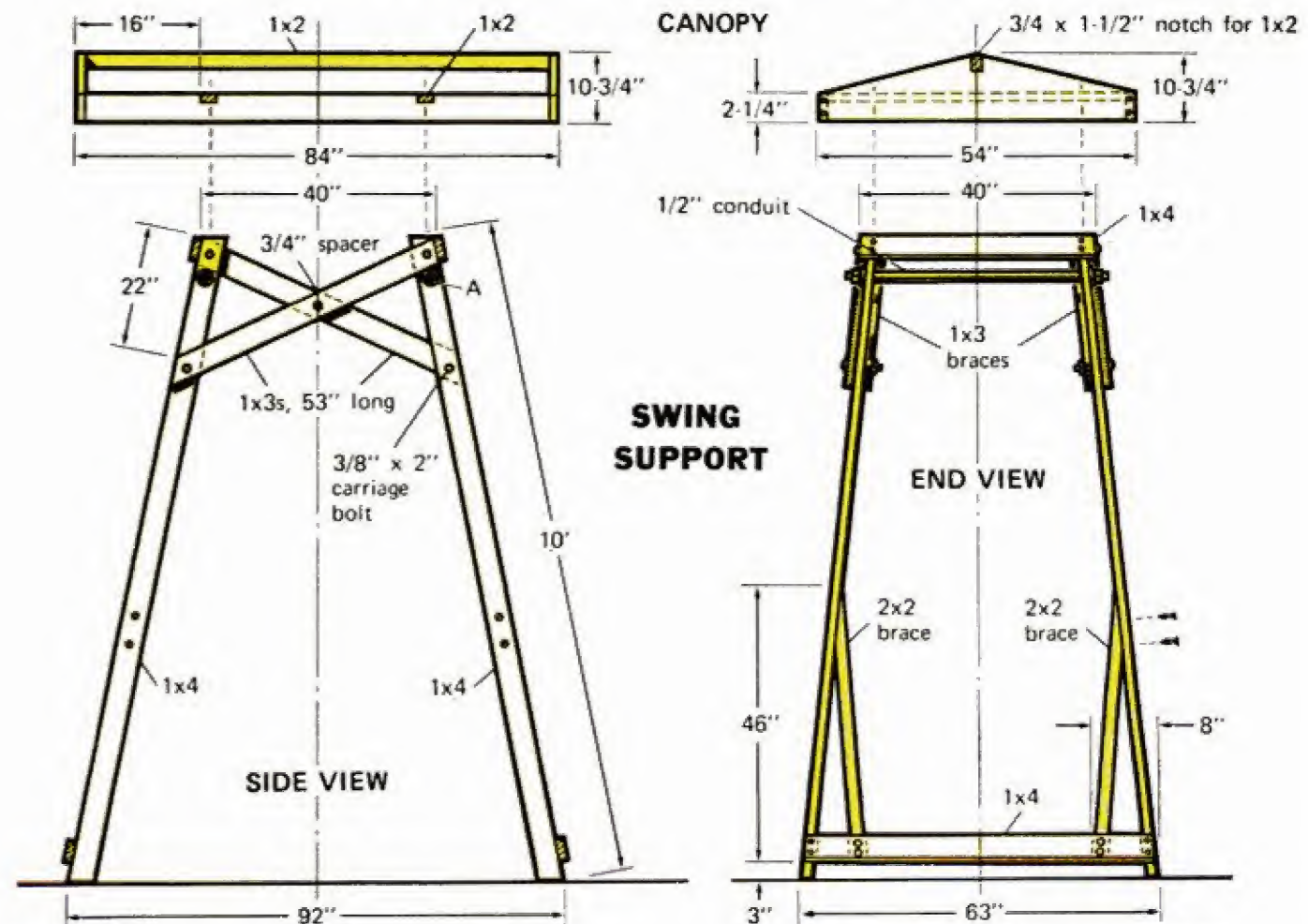
**T**HE TWO-SEAT LAWN SWING of yesteryear is making a comeback. Once a familiar sight in everyone's yard, this old-time favorite is finding new life even in this modern age of airconditioning. A place you'd once head for to seek the cool breezes of a hot summer's night, such a swing has become a welcome spot to get away from teen-age din, to relax and unwind or, occasionally, just to sit and think.

My folks had one when I was a boy and

I can remember what fun it was to stand up and pump and make believe it was a train. Later on I found it to be one of the more favored spots to watch the moon with a best girl.

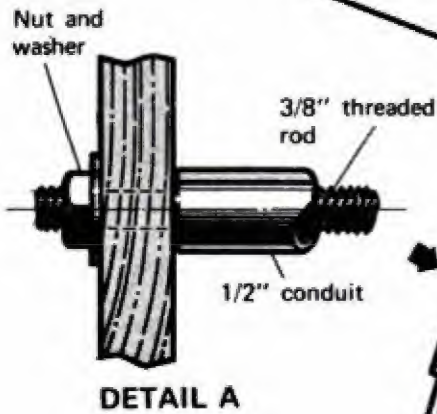
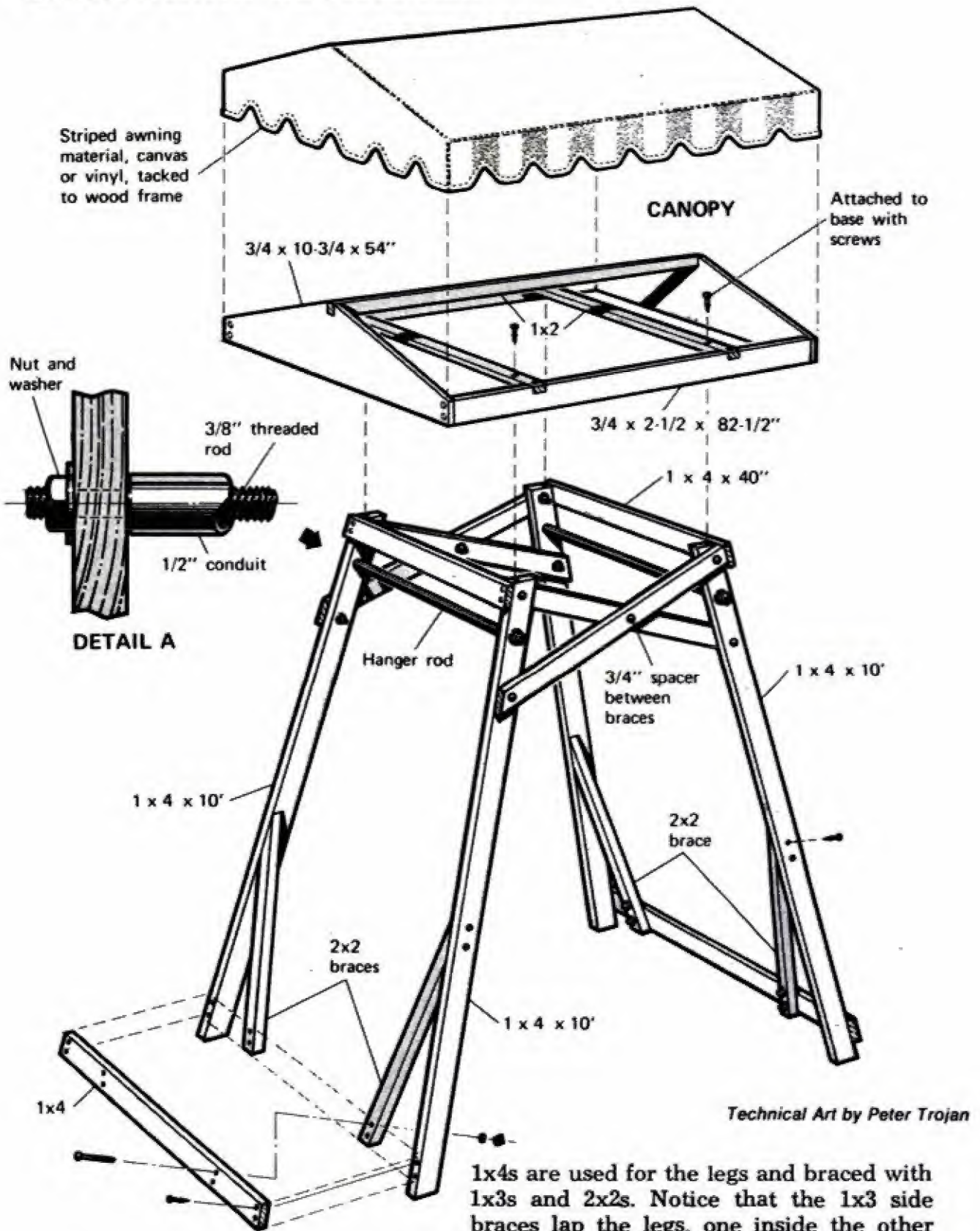
You can bring back a bit of the good old days by copying this old-time swing, setting it up in your yard and becoming a real "swinger" once again.

The whole thing is made from standard lumberyard material, which means that all the members are already the right





# LAWN SWING EXPLODED VIEW



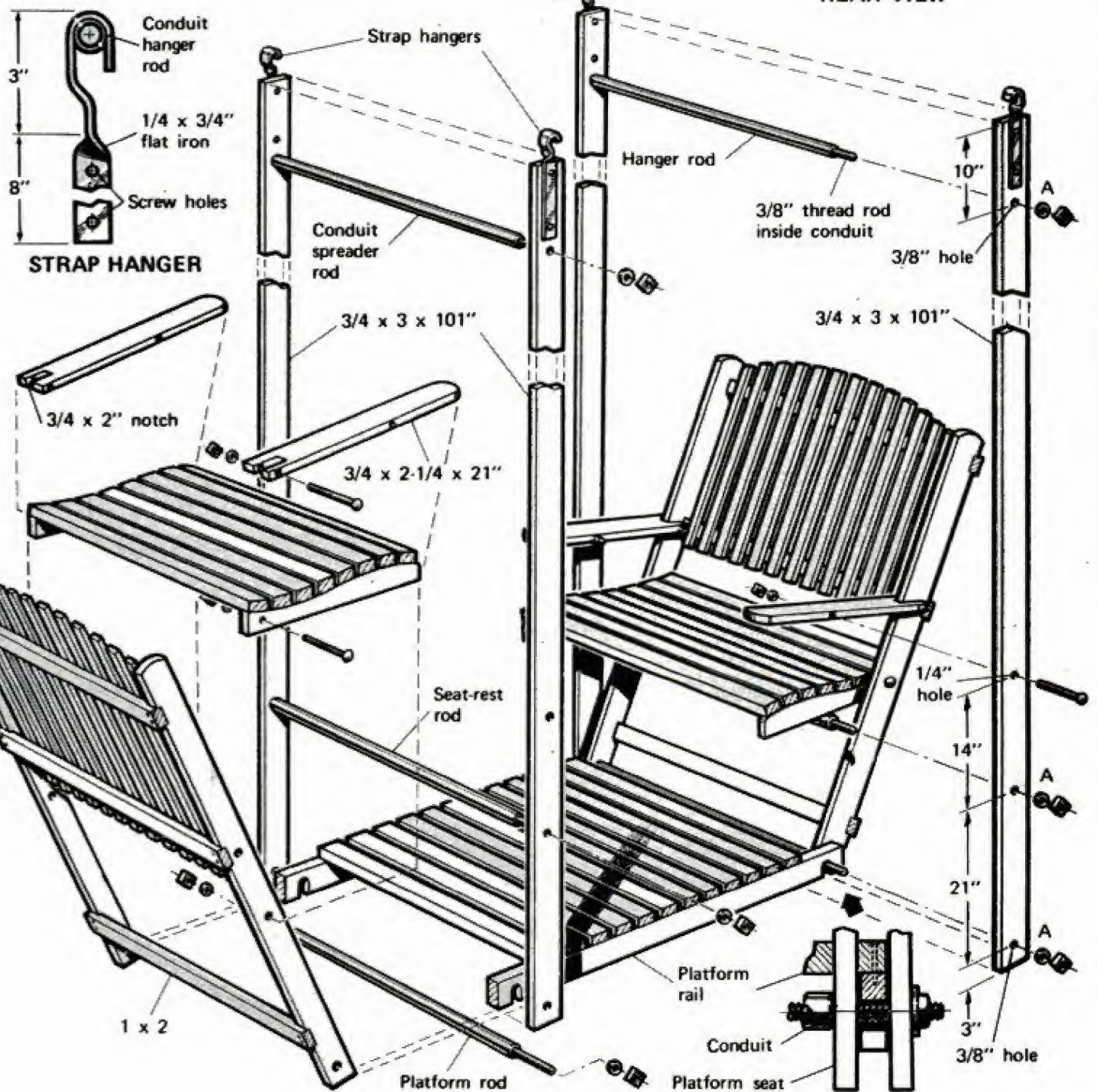
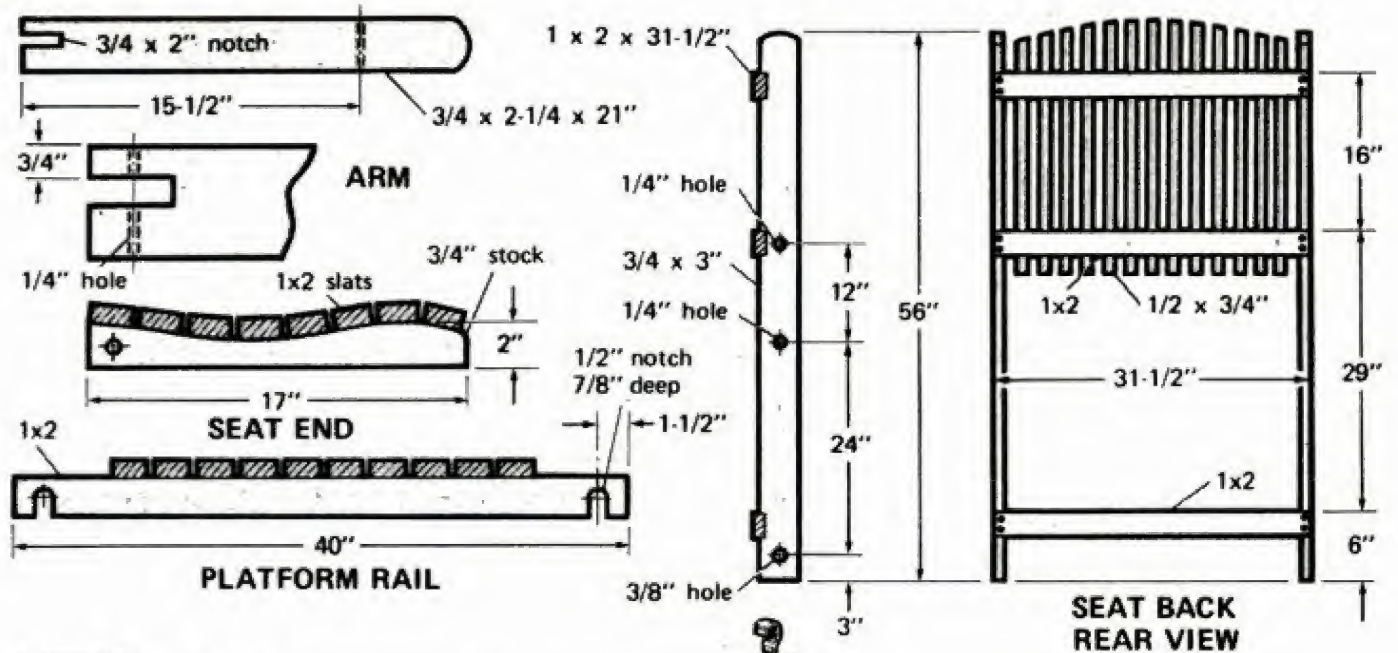
thickness and width when you get them. For the most part you simply cut the pieces to length and bolt or screw them together. The exceptions are the four curved seat rails. Many of the members are alike, requiring two or more of each.

Start with the swing-supporting framework detailed on page 140. Here 10-ft.

1x4s are used for the legs and braced with 1x3s and 2x2s. Notice that the 1x3 side braces lap the legs, one inside the other outside, and are filled where they cross each other with a 3/4-in.-thick spacer block. Notice, too, that the legs spread out at the bottom in both directions for better rigidity.

The conduit rods from which the swing seats hang, are tightened securely between the legs by nuts and washers as

(Please turn to page 174)





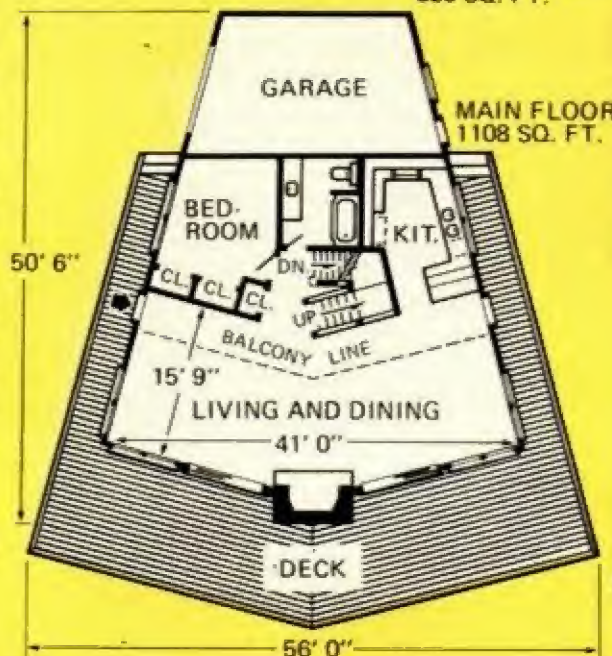
# Second Homes That Can Become

## Contemporary Trilevel

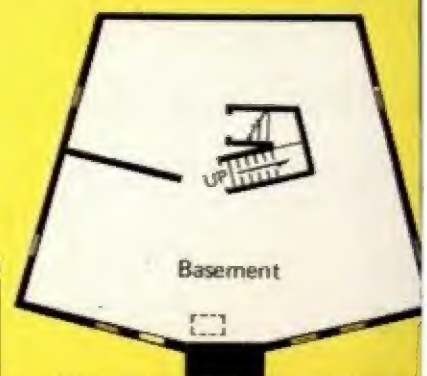
DESIGNED to suit architectural restrictions that a sloping lot imposes upon the builder, this triple-level home (right) can be built to feature a view to the rear where privacy is insured. The plans suggest three different exterior treatments and three ways to finish the top-level bedroom. A most interesting feature is the way you enter the dwelling and overlook the dining-living area below. The wraparound deck provides ample area for socializing, entertaining or sunbathing. To order, specify HBPS Plan No. 25 B.



SECOND FLOOR  
625 SQ. FT.

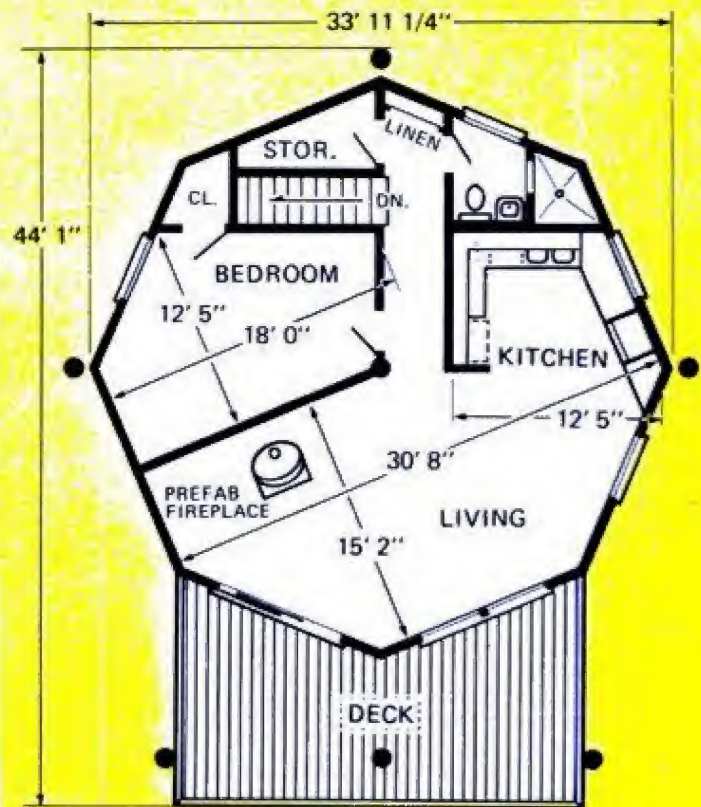


MAIN FLOOR  
1108 SQ. FT.



## Octagonal House

This floor plan reflects the experience of designer Ralph C. Rittenour with octagon-shaped dwellings. Multipurpose in function, it features a garage with room for car, boat and trailer, and upstairs, a one-bedroom apartment with large open-plan kitchen and living areas. Model HBPS No. 854 shown revises the *Octagonal House* (page 176, April '69 PM) with refinements readers asked for. For plans of the first four homes shown, see page 147.

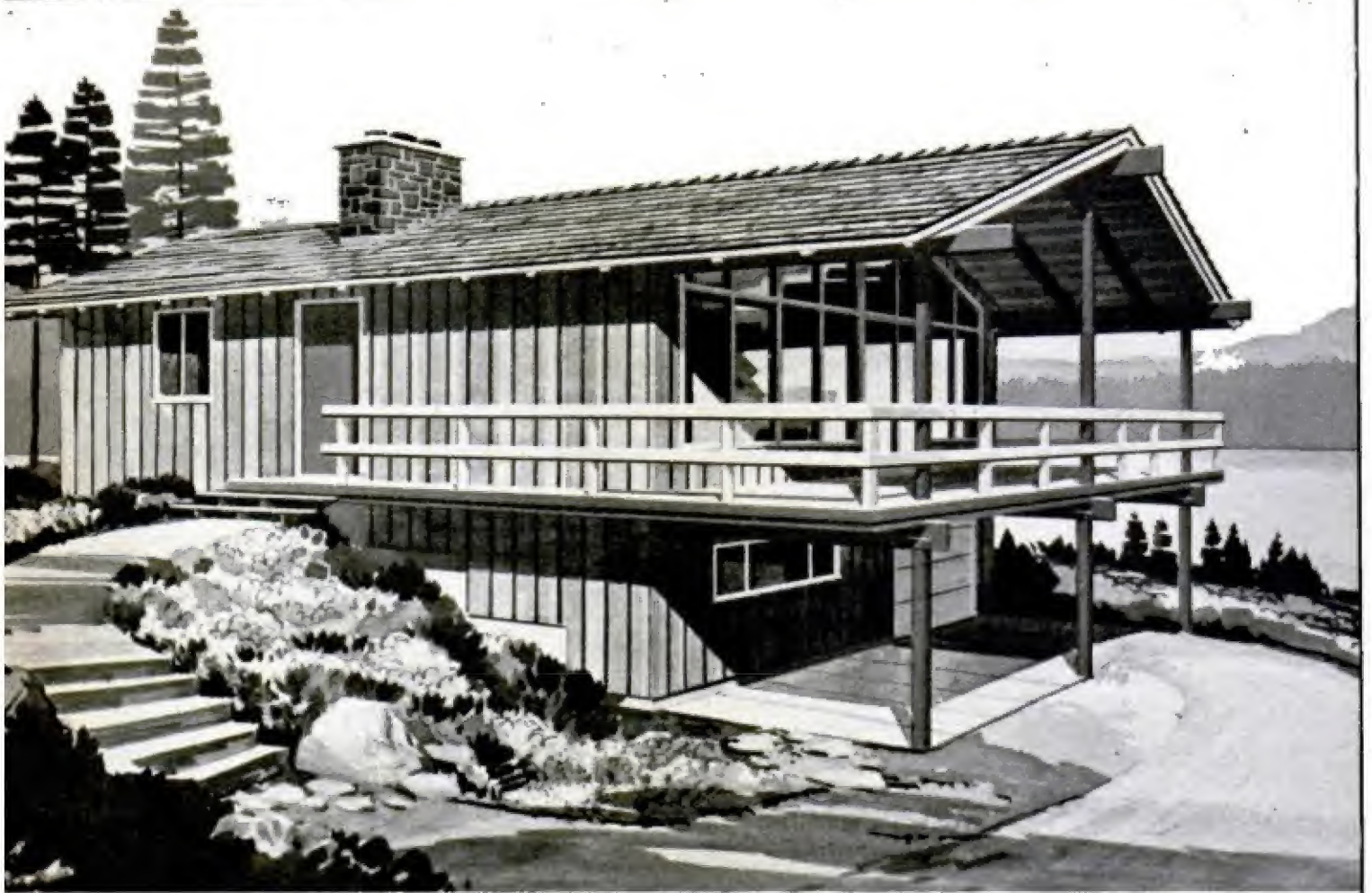


UPPER LEVEL  
821 SQ. FT.

# 'First!'

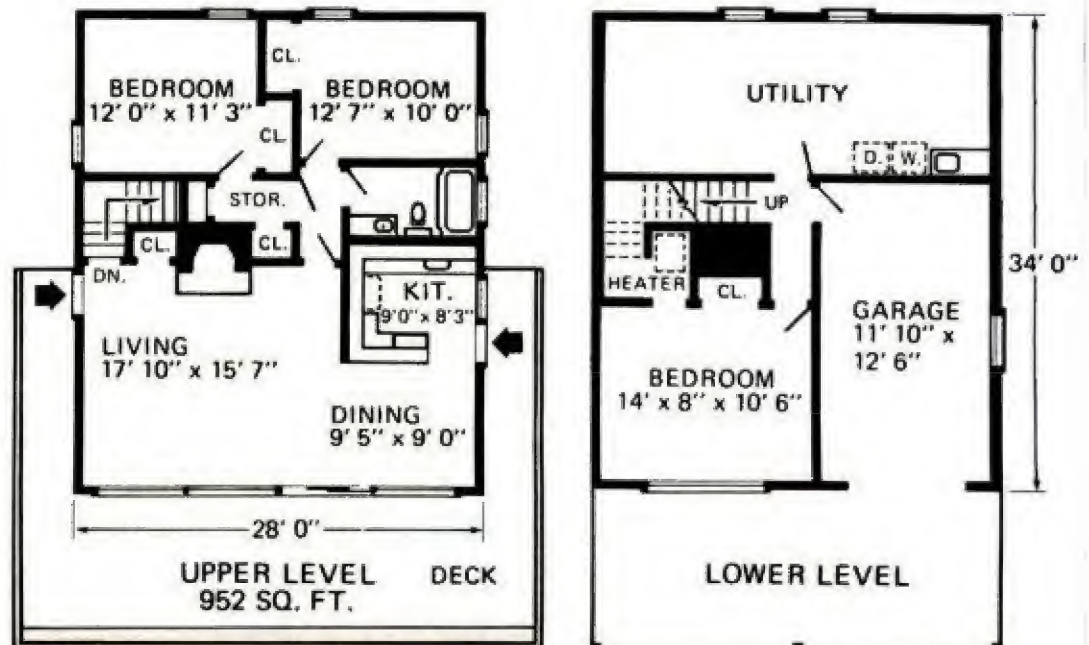
If well-planned, a second home can be a sound investment as well as a welcome retreat from everyday living





## A Cottage for Sea or Ski

Basic in design, the plan for this second home permits an alternate use of the lower level for a third bedroom and garage, plus utility space. There are no tricky or out-of-the-ordinary design features, and construction throughout is standard. Probably because of its simplicity and versatility—additions or patios can be added with minimum fuss and expense—this type home is extremely popular year after year, the designer says. For economy-minded, second-home owners, the interior can be left unfinished with studs exposed; as funds become available, rooms can be finished one at a time. Initial investment here is mostly in kitchen and bath fixtures and a high-quality, long-lasting exterior finish. To order plans for the cottage, specify HBPS Plan No. 833-1.

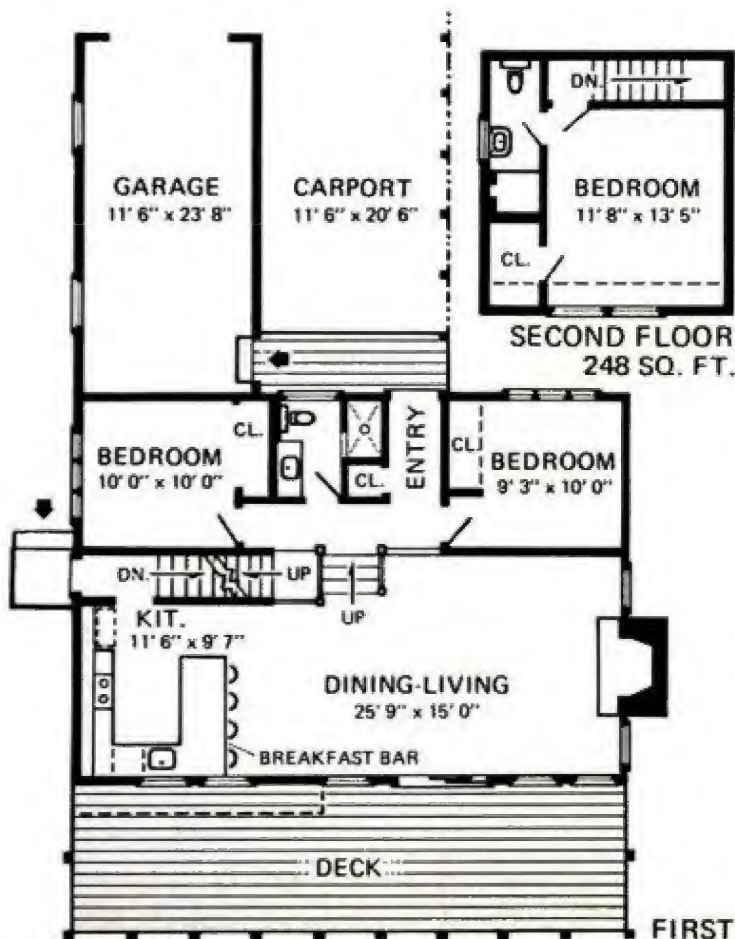






## Americanized Swiss Chalet

The floor plan for this home is one of three versions offered. The other two layouts have one bedroom on the first floor and the kitchen moved to the rear. As shown, the plan is available with a basement used as a garage. There are alternate plans for those who would rather not have a basement. The carport, while not a must, frees the garage area for use as a utility or storage room. If the garage is used to house a car, the porch can be extended under the covering to create a roomy patio. "Gingerbread" ordinarily found in chalet-type houses is deliberately omitted. HBPS Plan No. 26.



### HOW TO ORDER PLANS

You can purchase complete plans for the houses shown above and on the preceding three pages for \$30 per set per house or \$40 for four sets of the same plan. Add \$5 for materials list. As a rule, four sets of plans are needed for permits, cost estimates, financing and construction. Send your order to Home Building Plan Service, 2235 N.E. Sandy Blvd., Portland, Ore. Be sure to specify the plan number wanted.

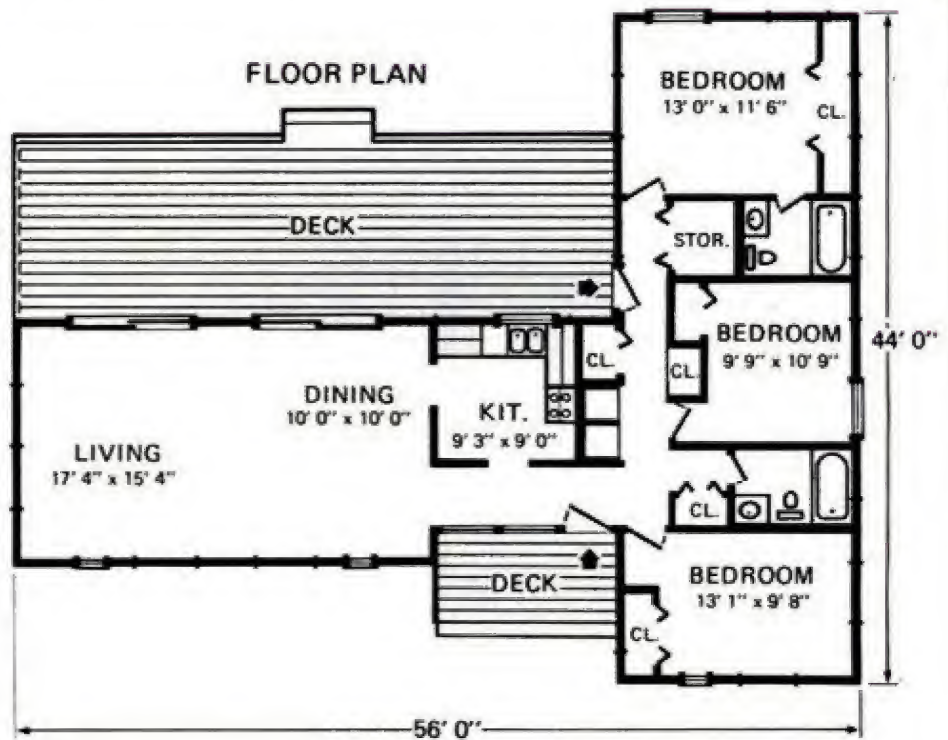
The package homes shown on the next five pages can be built for you by local builders in various areas. For more information, write the manufacturer specified.



## Informal Living for Sun and Surf Fun

Flexible design is the key feature in this handsome contemporary home. The dwelling can be customized to suit a family's needs because the basic structure is expandable in 4-ft. increments. The fabricator claims the selection of an alternate, or enlarged, floor plan will have little effect on outward appearance. A variety of exterior-finish treatments are available—from smooth to rough sawn—so you can make your home distinctive and a reflection of your individual taste. This model and the others offered by the manufacturer are fully insulated to meet most electrical heating requirements and provide year-round comfort for your family.

For more information on the Mark IV, write Leisure Homes, Dept. PM, 3609 Logangate Road, Youngstown, Ohio 44505. The manufacturer will send you a kit of



vacation-home plans (enclose \$1 for handling). Mention the specific location of the lot on which you plan to build and the manufacturer will refer you to the nearest local dealer. Distribution is east of the Mississippi; if there is no dealer in your area, Leisure Homes will ship direct.

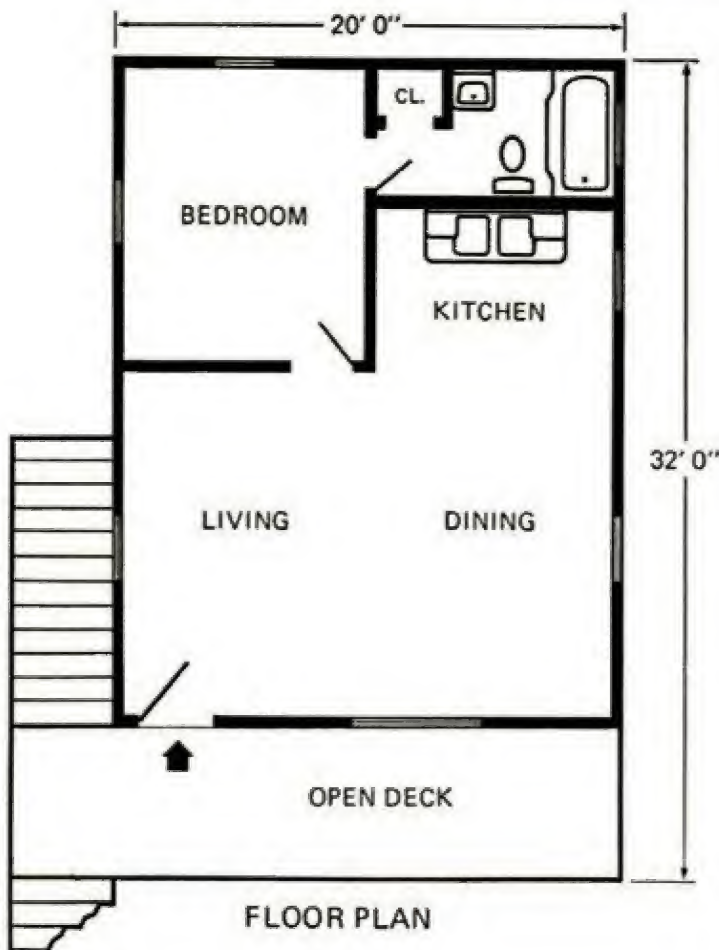


## Good Living in a Low-Cost Hideaway

The clean uncluttered lines of this home almost conceal the fact that the structure boasts a comfortable 848 sq. ft. of living space. Designed and built with the quality-oriented buyer in mind, this model costs approximately \$12,000 f.o.b. Downingtown, Pa. (The manufacturer's distribution area covers the entire Northeast from Maine to North Carolina.) Designed by Herman York, A.I.A., the Flexi-Built is sold with a full one-year guarantee.

The T-shaped floor plan wisely separates the sleeping quarters from the active, and sometimes noisy, living area. You can select exterior siding from such popular materials as rough-sawn redwood, cedar board and batten, redwood clapboard and vertical-groove siding. Inside, the dwelling comes with such creature comforts as fully equipped kitchen, high-quality doors and wall-to-wall carpeting. For information, write Designaire Modular Home Corp., 65 E. Northfield Rd., Livingston, N.J. 07039.





## Weekend Retreat For Shore or Country

If you have the lot and about \$5500, the builder can have this house ready for occupancy just about the time you are all set to move in for the season. At that price you get the shell; for approximately \$2500 more (\$8000 total) the builder will have the house 90 percent complete ("90 percent" means that everything is finished inside and out, according to the builder, except for interior painting and sanding of floors.)

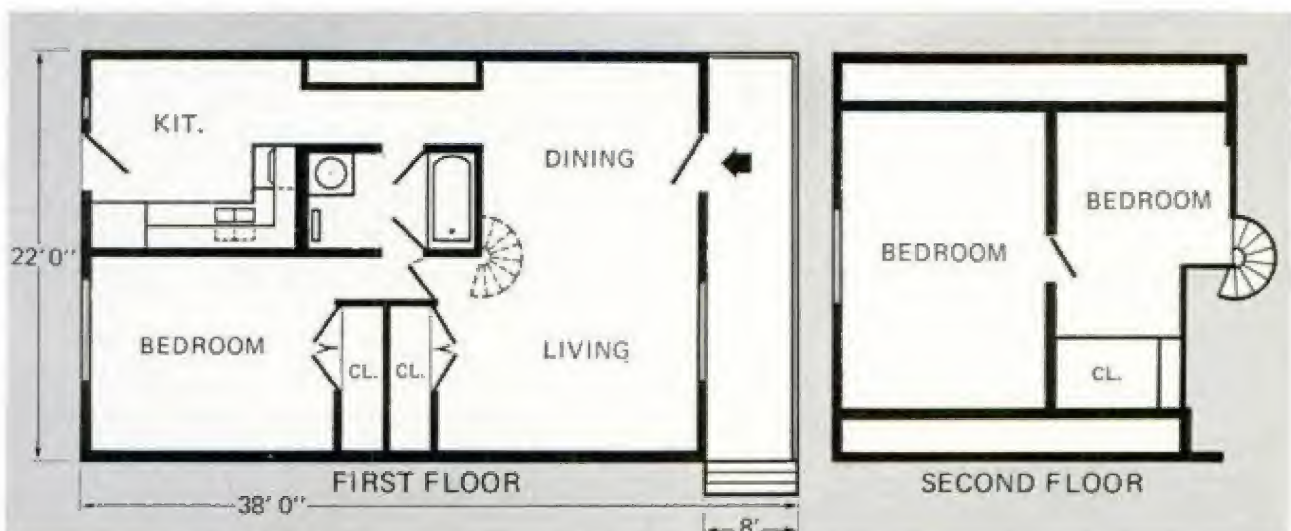
Rustic siding and exposed beams on the cathedral ceiling heighten the feeling of spaciousness that vacationers delight in. Designed to rest upon piers as shown, the home can be built over the ground or water to give parking for an automobile or handy boat docking. Here, the owner chose to stay over land and add a walk from the stairs down to the dock. The builder, Jim Walter Corp., 1500 N. Dale Mabry, Tampa, Fla. 33607, delivers to approximately 30 states.



## Now It's 'Instant' Leisure Living

This little beauty arrives at your site on wheels, completely finished—with furniture and appliances, even a fireplace—ready to be set on a simplified foundation and connected to utilities. Used as shown, Cedar Chalet will comfortably sleep five—and more, if one member of the family doesn't object to sofa-sleeping.

Built by BurKin Home Corp., White Pigeon, Mich. 49099, the home runs \$13,000 to \$17,000, not including the price of the land. The interior is luxuriously finished in pre-finished paneling, which means you won't spend your weekends painting and maintaining. The manufacturer delivers to 36 states. Write to BurKin to find out if your property is in one of them.





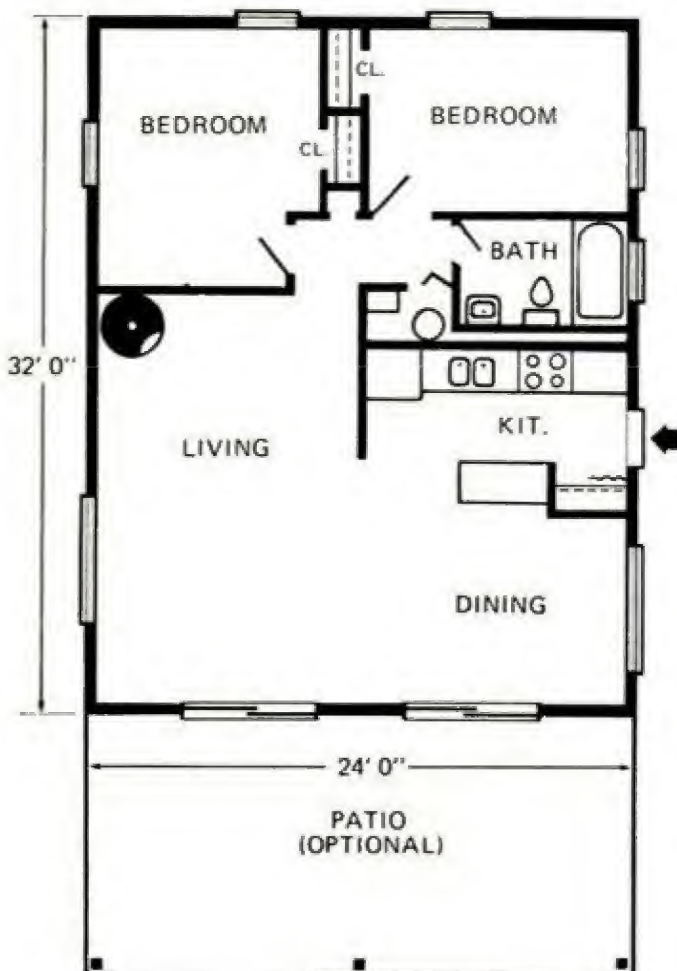
## Simple Lines Blend With the Land

The best feature of this second home is its simplicity of design. The rectangular floor area is covered by a conventional A-type roof which lets you expand out or up. It's intended primarily for fairly level land where it can blend harmoniously with woods or sand dunes.

Model 612, the Paradise Lodge (above), has a floor area of about 768 sq. ft. with a patio and fireplace (shown) as optional extras. For a price quote on this home, or one of the other nine models it offers, contact National Homes Corp., Dept. PM, Box 680, Lafayette, Ind. 47902. The manufacturer will have a franchised dealer in your area give you a price for the specific location (approximately \$10,000).

Though an option, the patio is a sound initial investment. If it's screened-in, you'll have bugfree comfort for nighttime sittin' and relaxin', or an open-air bedroom for comfortable sleeping on those hot, muggy nights.

★★★



# Tic-Tac-Toe You Can Play Anywhere



By **MERTON H. SLUTZ**

*Technical Art by Fred L. Wolff*

HERE'S A PROJECT you can complete in a single workshop session. It's the old familiar game of tic-tac-toe with a new three-dimensional twist. Completely self-contained, the game can be taken along on long motor trips to keep youngsters actively engaged and happily quiet.

The game consists of a frame, divided into nine equal compartments, which serves as the playing grid. Each "playing surface" is actually a triangular block of wood which is center-pivoted and re-

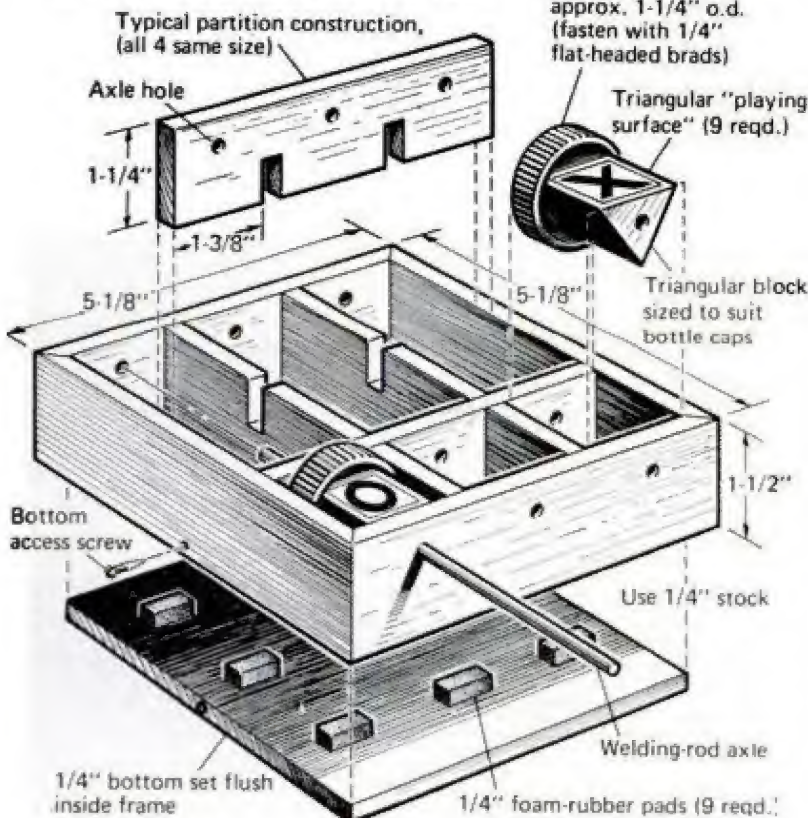
volves to reveal an X, O or a blank surface. The "dials" for turning the blocks are simply glued-on pill-bottle caps, but if you decide to build your game of fine hardwood, you may prefer to turn customized dials on your lathe.

Notice the 1/4-in. foam-rubber pads glued to the base. These serve as brakes that give just enough resistance as each dial is turned.

To make the triangular pieces, cut one long length on the jointer, then slice off the nine segments. And, before gluing the pill-bottle caps in place, cut off the thumb lifter-tabs. Use an epoxy cement and then drill the centerholes which will receive the axles. This should be done carefully because the holes determine final alignment.

Notice that the four outside corners are mitered and that the partitions are simply butt-joined. Three lengths of welding rod are cut to span three compartments, and at each intersection with a partition a dab of epoxy is applied to prevent their moving. (The axles are fastened securely and only the triangular pieces revolve.) Before finishing, fill the outside axle holes with wood filler and sand the surface flush. The completed game can be painted or stained, depending upon personal preference. The Xs and Os can either be burned-in or stick-on letters. ★★★

## THREE-DIMENSION TIC-TAC-TOE





# Build This Cabana Now—Use It All Year

By DON SHINER / Photos by the Author

**T**HERE are two distinct advantages to be gained from erecting a small structure adjacent to your pool. For one thing, you'll keep wet bathers from dripping water throughout the house because they'll have a convenient place to dry off and change. And when the pool is closed down at the end of the season, the little house can be put to good use for winter storage of seasonal items such as tractors, lawn furniture and the like.

The handsome cabana shown above gives 84 sq. ft. (it measures approximately 7 x 12 ft.) for year-round use to suit your family's needs. Construction is conventional as can be seen in the drawings that follow. Our experience has proven that it is far more convenient if it is located close to the pool. If the apron around your pool is too narrow to accommodate the house, it is well worth the slight extra effort and investment to increase the apron on one end, or, if you would rather have the house located elsewhere, simply add a connec-



ting flagstone walk between the new slab and the existing apron next to the pool.

The house is built following standard building procedures. First, stake out the desired location and remove all topsoil. Dig and pour footings around the perimeter to meet local area requirements and then pour a 4 to 5-in.-thick slab. (*Editor's note:* Before starting actual construction, check with your local building department; you may be required to obtain a building permit.) In my case, the existing pool slab was wide enough to accommodate the little house so I simply laid a double bead of caulking on the concrete over which the sole plates were laid. Use screws and lead anchors to secure them.

The 2x3s used for the studding provide more than adequate strength because there is a rather steep roof pitch to eliminate snow (load) accumulation during the winter months. The rafters are nominal 2x4s nailed 16 in. o.c., each directly over a stud. For ventilation, I installed a window on each side of the house. Window size can be determined by personal choice or by what windows might be on sale at the local lumberyard. The rafters are covered with 5/8-in. plywood, followed by 15-lb. felt and asphalt shingles. Wall construction was kept simple (and economical) by using 4x8-ft. sheets of Homosote, which stands up well against the weather. It can be painted at first, and, as funds are available, covered with siding or shingles to match your home.

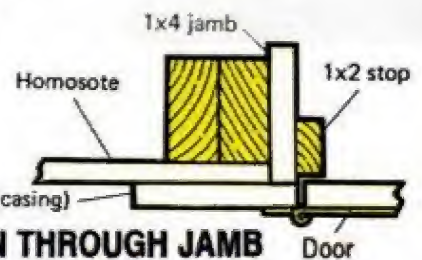
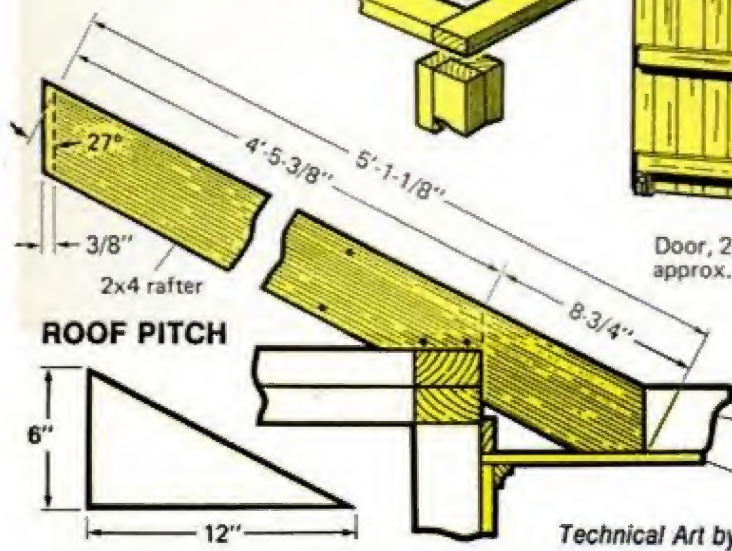
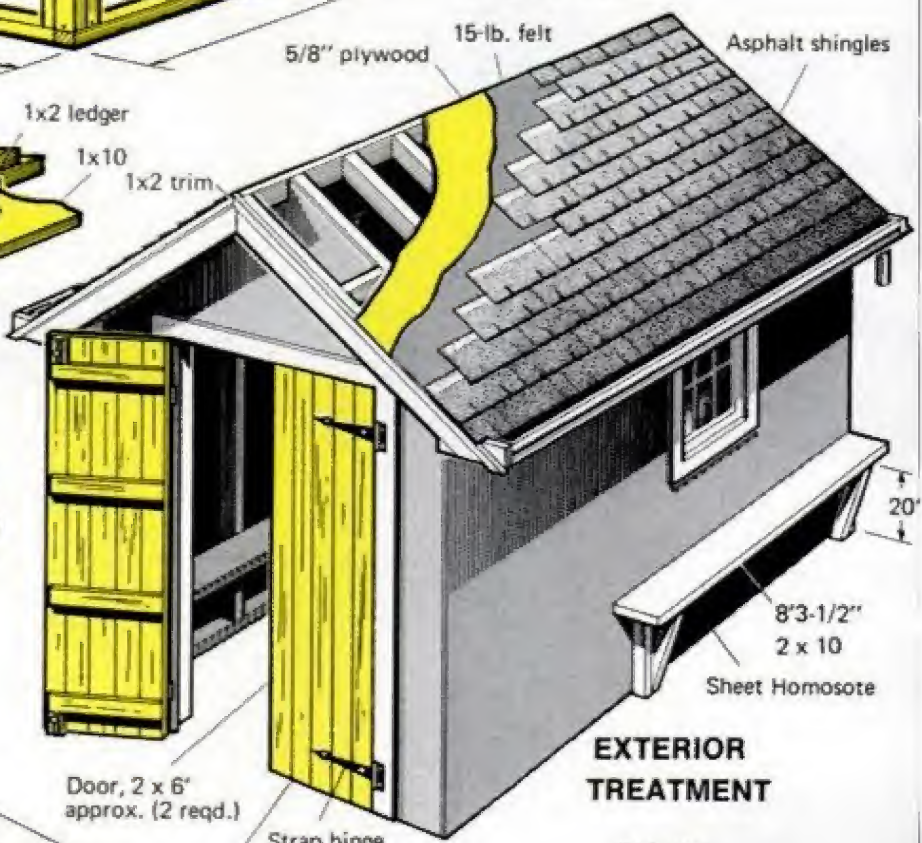
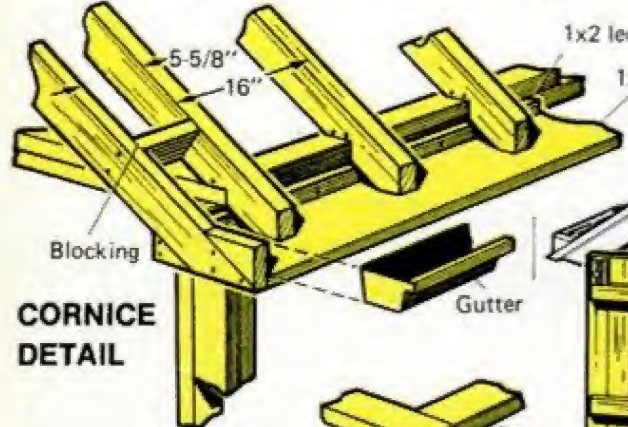
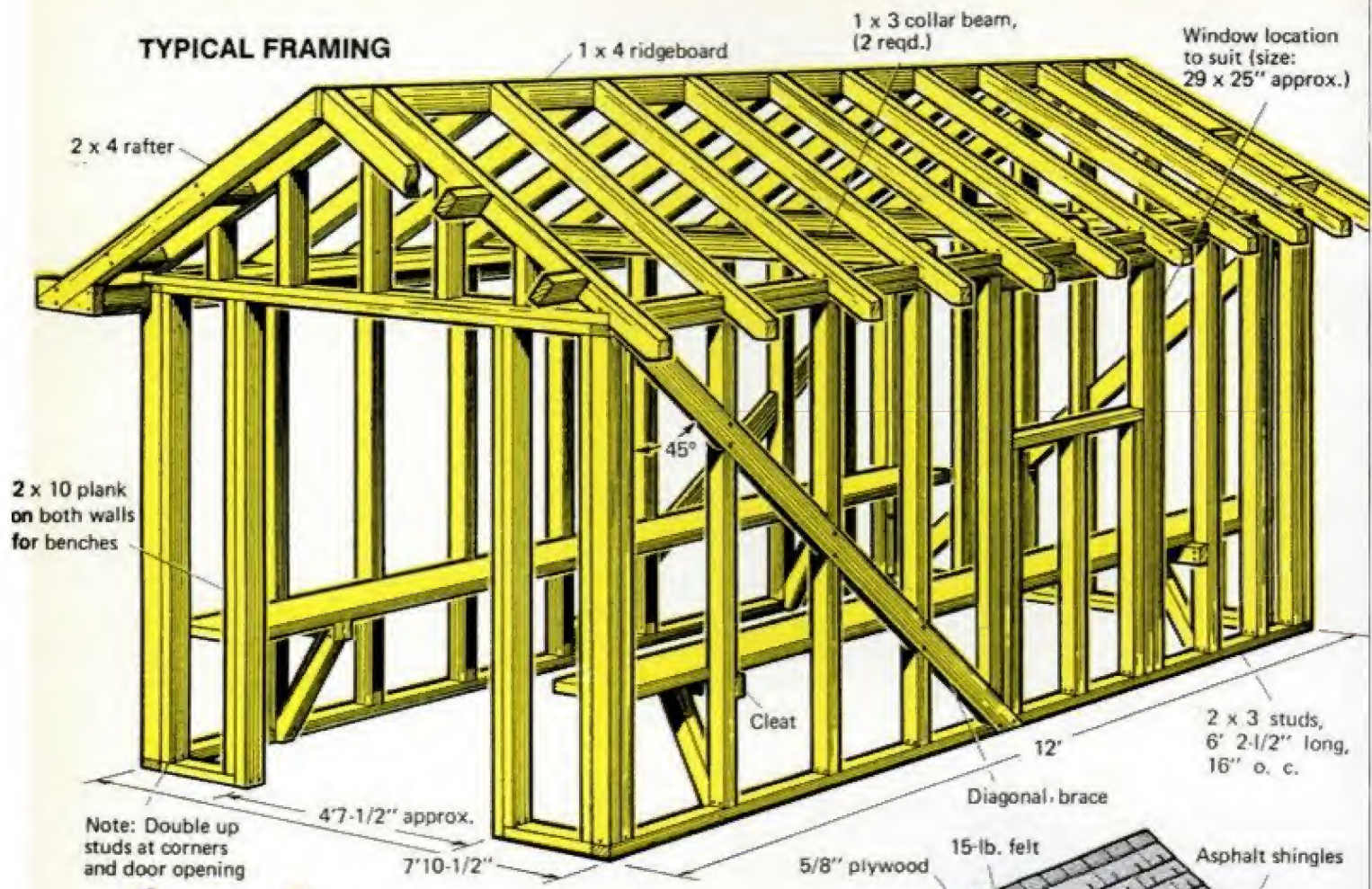
If desired, the cabana can be partitioned inside to provide individual dressing rooms. We chose to leave it as one big room so that the winter storage space would not be cut down or made impractical.

The doors are constructed of boards held together with horizontal strips nailed on the inside. Barrel-type door



**CABANA PROVIDES SPACE** for bathers changing to swim togs and, as a bonus, there is extra storage for lawn equipment and tractor rider-mower

# TYPICAL FRAMING



Technical Art by Fred Wolff

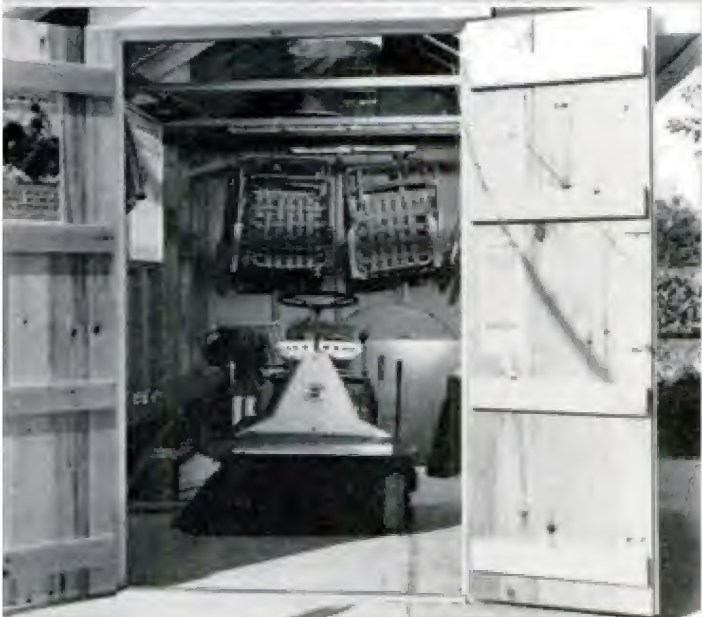
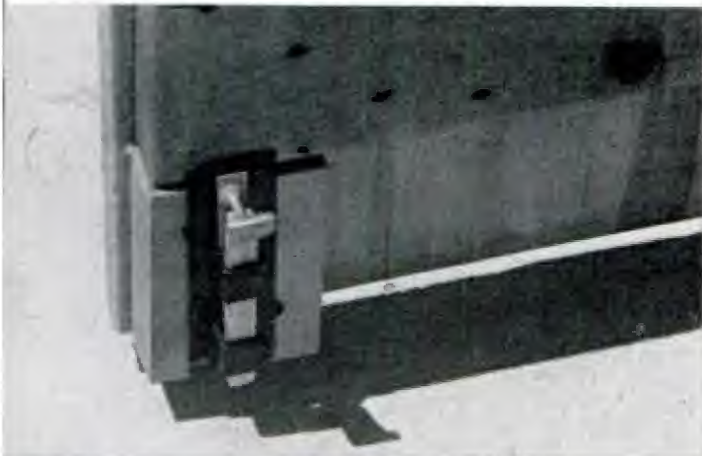
## SECTION THROUGH JAMB

bolts are fastened to one door at top and bottom to enter holes drilled in the slab and header. Add a standard doorknob and strap hinges to complete the door hardware.

We chose to install two 2-ft.-wide doors because of a riding tractor. If you don't own one, or will never have the need for one, you might prefer to install a standard 2½ or 3-ft.-wide single door in the conventional manner.

Since there was no reason to do any fancy finishing, I chose to leave the interior unfinished. For convenience, however, I installed two 2x10-in. benches the full length of both walls. The diagonal bracing (as shown above) provides more than adequate strength and there has been no noticeable sagging. Because the house is next to the pool, a short bench was fastened along an outside wall. Thus, whenever our youngsters have a gang in, there is more than enough seating for everybody. ★★

**DOORS ARE HELD CLOSED** by pair of sliding bolts on one, and a latch and pull combination on the other



APRIL 1971

## HINTS FROM READERS



### Thread spool makes 'anvil'

If you need a hole over which to punch holes in a strip of metal and don't want to drill a hole in your benchtop, an empty thread spool makes a perfect "anvil." Center the punch over the hole in the spool.—Walter E. Burton, Akron, Ohio.



### Drill press turns tenons

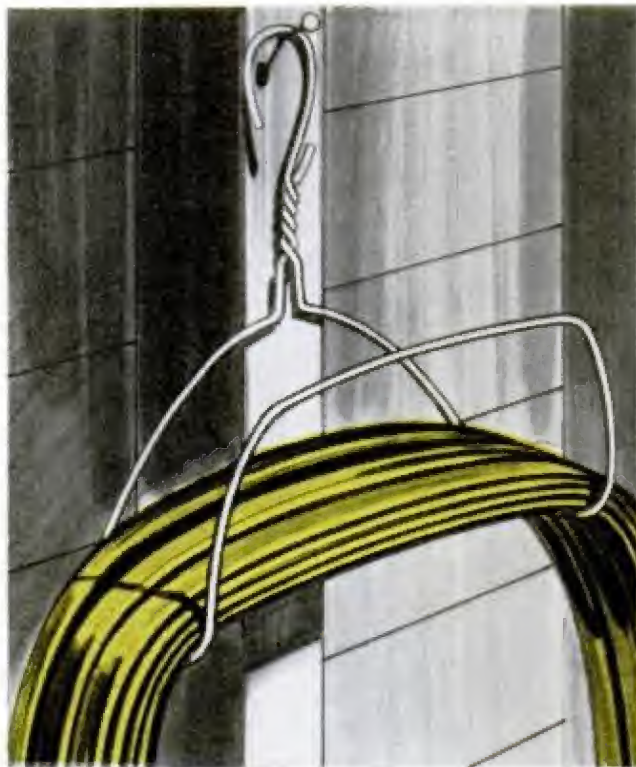
Recently I had to turn tenons on the ends of long wooden dowels, but I didn't have a lathe. I did the job with a fly-cutter in my drill press and used a homemade board clamp to hold the dowel in a vertical position. In use, the table is swung to one side and the board clamped to it.

—R. S. Hedin, Minneapolis.

157



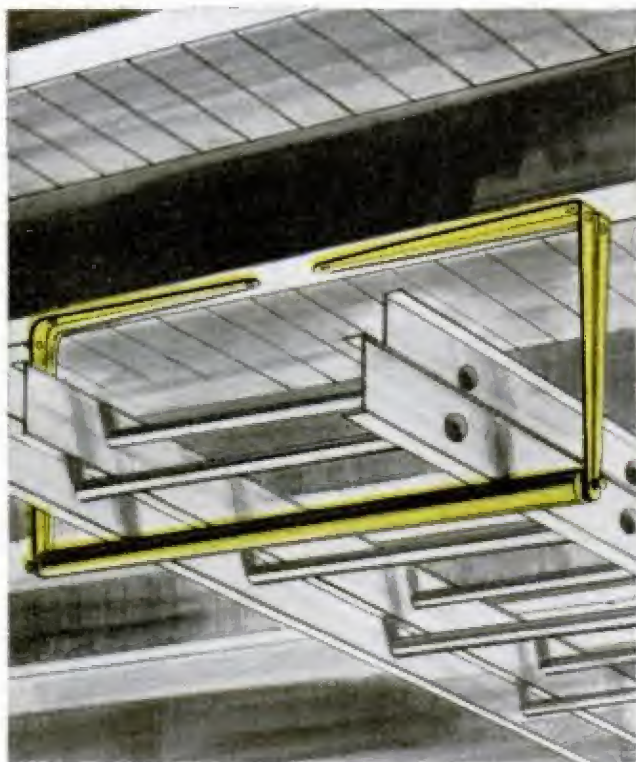
# SOLVING



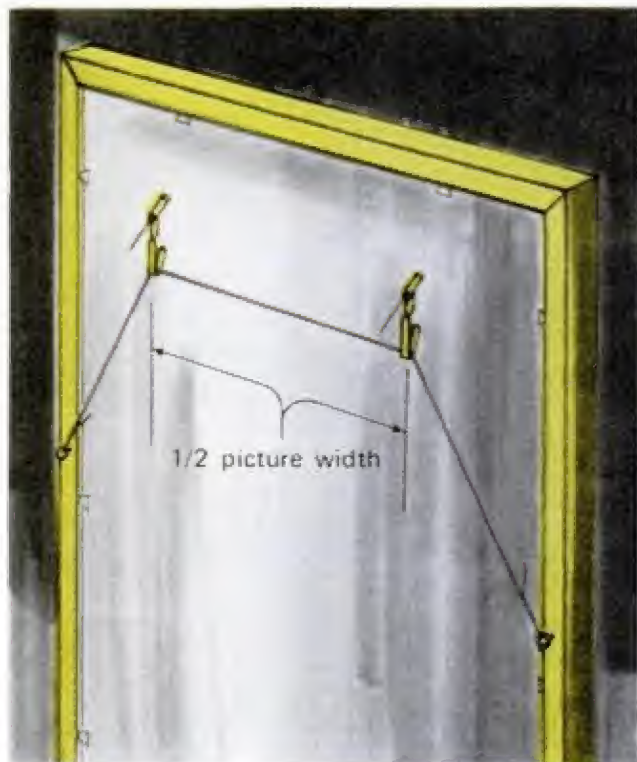
**HANDY "REEL"** for storing flat garden and soaker hoses can be made by bending a wire coathanger as shown. The reel can also be used to carry your hose to where you will use it.—*E. V. Reyner, Salinas, Calif.*



**SMALL PAD OF GLASS WOOL** in bottom of flowerpot holds the dirt in but lets water seep through (as it must) for healthy plant growth. Piece of home insulation works fine.—*Jackson Hand, Westport, Conn.*



**INEXPENSIVE LADDER STORAGE** can be made by fastening shelf brackets to garage collar beams. Use old broom handles for the "rollers" and fasten them with heavy screws.—*Donald L. Neyhard, Hershey, Pa.*



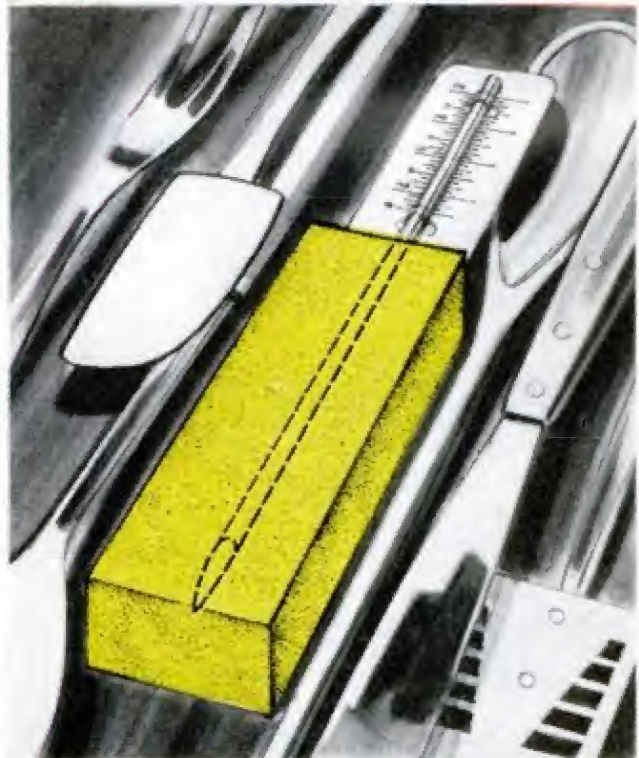
**KEEP PICTURE FROM SWINGING ASKEW** by using two hangers. Place them about one-quarter of frame's width in from each side edge and kink wire slightly over the hooks.—*Dan D. Grissinger, Wellington, Ohio*

# HOME PROBLEMS

Illustrations by Adolph Brotman, Worman Associates



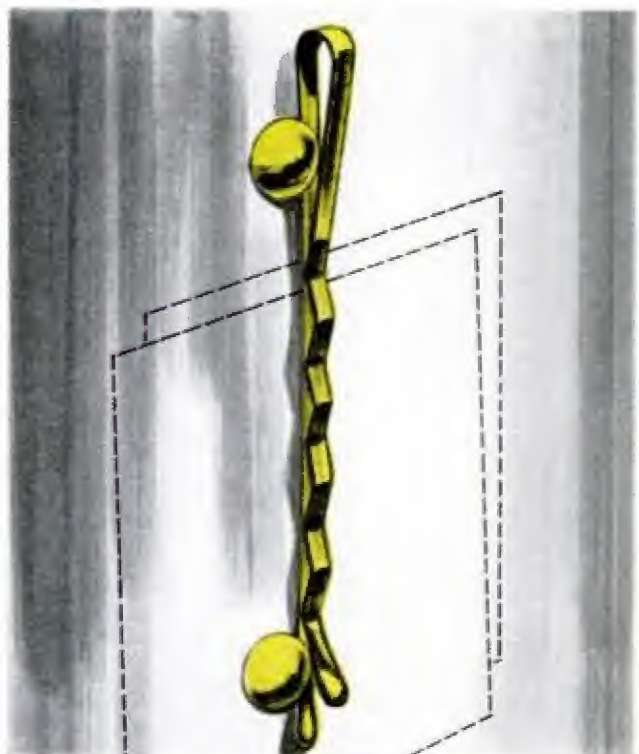
**TO MIX PATCHING PLASTER QUICKLY**, use half of a rubber ball. It fits the hand nicely and when a job is done you can discard any leftovers by rapping ball on a hard surface.—*William Swallow, Brooklyn*




**MEAT THERMOMETERS** are easily broken or knocked out of whack if kept unprotected in a cutlery drawer. A Styrofoam sheath you can make from scrap will eliminate this breakage.—*Ernie Wiczorek, Chicago*



**AN OLD RAKE** makes a dandy holder for those small tools that often tend to become misplaced in the garage. Use a couple of staples or clinched nails to secure it to a stud.—*Albert T. Pippi, Baltimore*



**HOLDER FOR SMALL MEMO PADS** can be improvised using a bobby pin and a couple of thumbtacks. Attach it to your kitchen or workshop wall using the tack heads to hold the pin.—*Frank Shore, New York*



# Your Garage Can Be a Screened Summer Room

When winter comes, the screens come down in minutes, and the space reverts to its original use

By CRAIG WILSON

**A** QUICK, INEXPENSIVE WAY to gain a closed-in patio is simply to screen an existing garage. Though an attached garage is more desirable for this improvement, there's no reason why the idea can not be adapted to a detached one. Either way, you will gain by giving those noisy, sometimes clutter-prone, bored youngsters a place to play on a rainy day or creating a spot for Mom and Dad to get away from it all.

Since my garage has a 15-ft.-wide door opening, I laid out the screened wall in six panels, including the convenience door at one end. And, because my wife and I don't particularly care for airconditioning, I installed a 24-in. fan in the wall between the house and garage. Thus, the screened opening is ample for drawing cool, evening breezes into our home.

Before starting the project, make certain that the garage-door handle projects no farther than the garage-door stops. Then lay the sole plate along the garage-



**BUG-FREE PARTY ROOM** shown at top of page gives all advantages of outdoor living plus protection from the weather. Whenever it rains, garage doors still close; weep holes in sole plate provide for runoff

door opening and line it up with the stops on the *inside*. This is fastened with flat-head wood screws into lead anchors

dropped into the concrete. When you disassemble the setup, the plugs can be filled with corks to prevent them from becoming clogged with dirt.

Divide your garage opening into panels 30 to 40 in. wide for best-looking results. The entrance door is optional but we have found that it was well worth the small amount of extra effort that building it required. For rigidity, I used a 2x2 as the door post (on the hinged side), fastening it at top and bottom with L-shaped brackets and screws.

For the usual reasons—weather and termite-resistant qualities—I used redwood throughout. The redwood can be stained natural or painted to suit your preference.

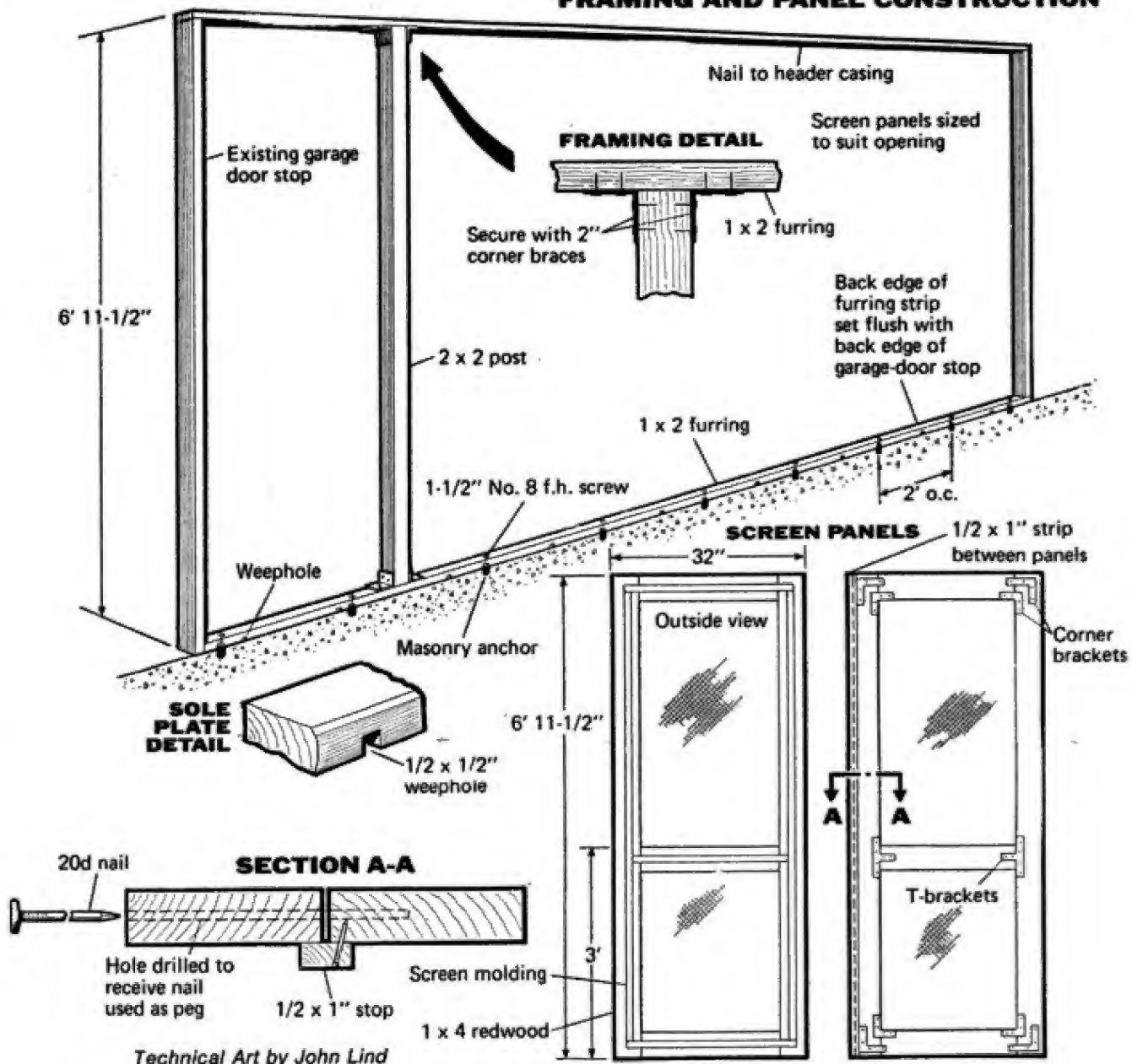
**Caution:** Since there's a more than even chance that your garage finished opening

may be out of plumb or not level, trim and fit the individual screens to their exact position in sequence. Link each screen to its neighbor as shown in the drawings, and, to save yourself some frustration next spring when putting them back up, number the screens for easy identification and quick placement.

If you decide to paint your screens, the finished job will look a lot neater if you do all the carpentry first, including temporary assembly. Then, take them down, prime and paint the wood and fasten the wire screening.

For wrinkle-free screens, use the time-tested method of shimming both ends and clamping the middle before stapling the screening to the framework. To finish, cover the staples with conventional screen molding. ★★★

### FRAMING AND PANEL CONSTRUCTION



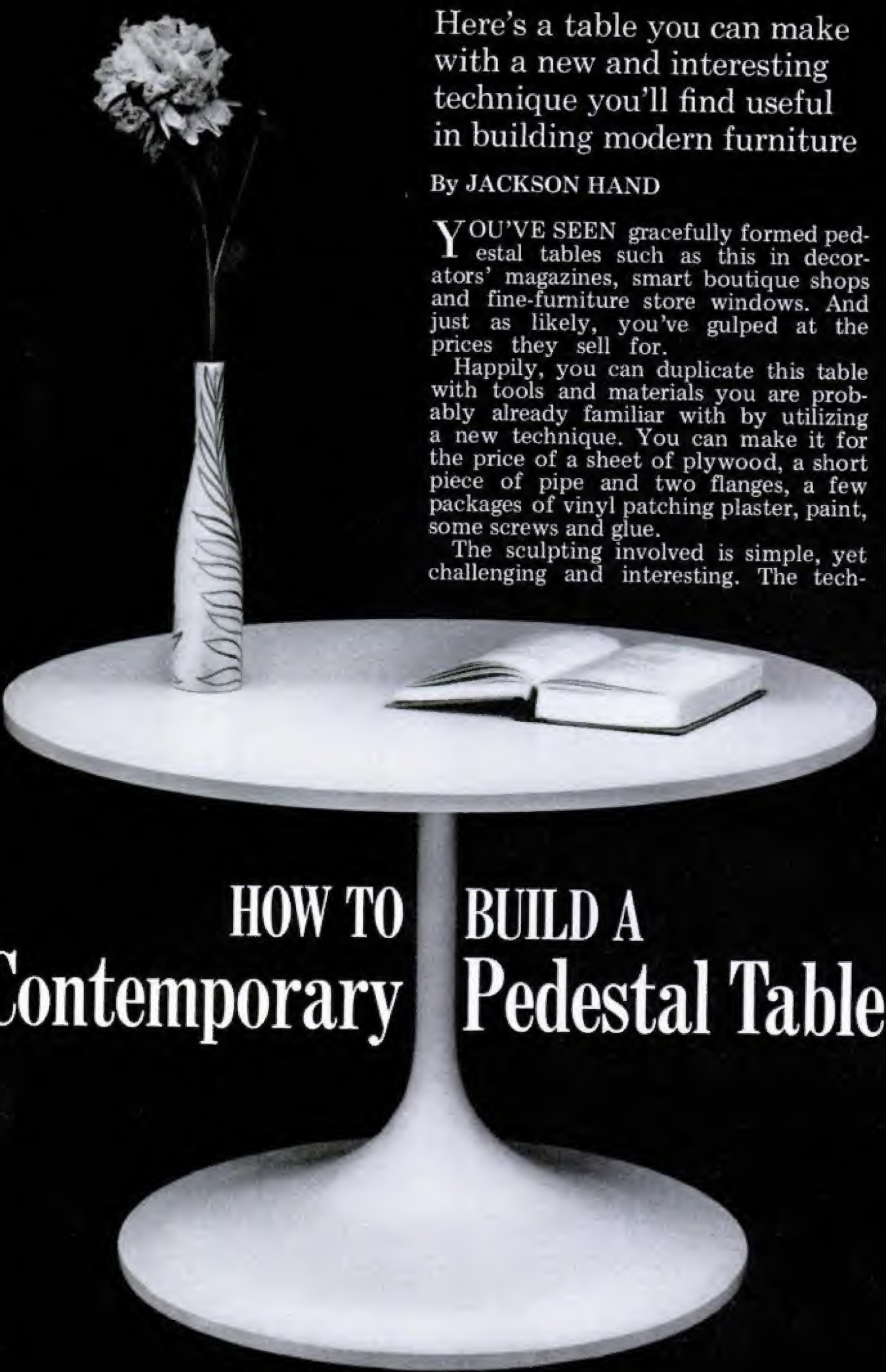
Here's a table you can make with a new and interesting technique you'll find useful in building modern furniture

By JACKSON HAND

**Y**OU'VE SEEN gracefully formed pedestal tables such as this in decorators' magazines, smart boutique shops and fine-furniture store windows. And just as likely, you've gulped at the prices they sell for.

Happily, you can duplicate this table with tools and materials you are probably already familiar with by utilizing a new technique. You can make it for the price of a sheet of plywood, a short piece of pipe and two flanges, a few packages of vinyl patching plaster, paint, some screws and glue.

The sculpting involved is simple, yet challenging and interesting. The tech-



**HOW TO BUILD A  
Contemporary Pedestal Table**



nique is a sort of cross between using a potter's wheel and doing clay sculpture—with a little spackling thrown in. The finished piece is graceful, but rugged and heavy. For a finish, you can paint it white, black or one of today's popular bright colors to suit the room decor. And the same construction techniques can be used to build such items as stands for TV, hi-fi speakers and the like.

The dimensions for the table shown are entirely arbitrary; the piece was made to be used as a fairly large occasional table. You can make it, of course, any size you wish; in practice, you're limited only by the standard 48-in. width of a plywood sheet.

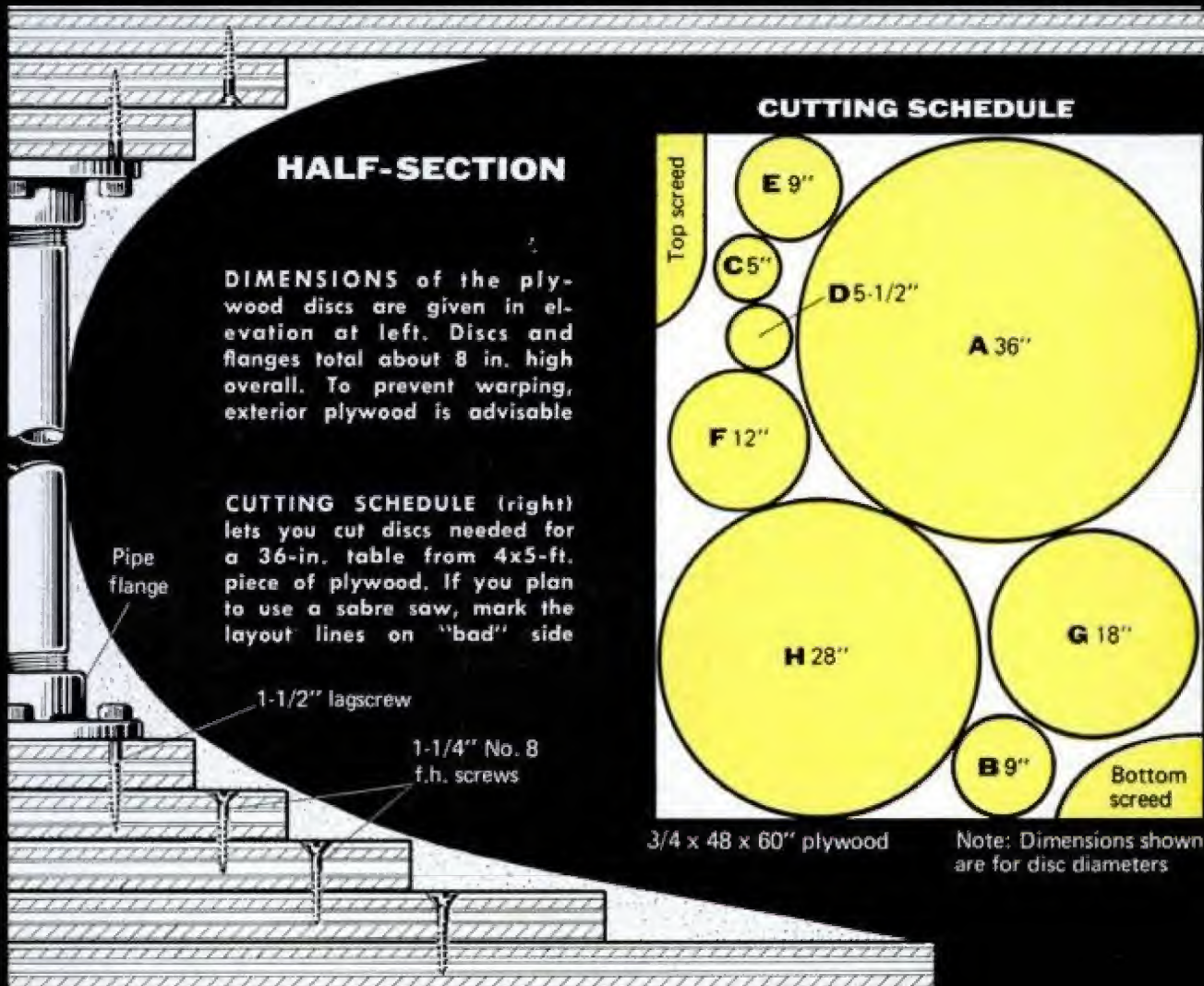
The basic skeleton of the table is a pair of built-up plywood discs—one for the top, one for the base. The stem is a length of 1½-in. galvanized pipe fastened to the top and the base with pipe flanges and lagscrews. All of the parts are then given shape with



PEDESTAL BASE is formed of glued-together, concentric plywood discs. Pipe determines table height

FINAL HEIGHT of table shown on opposite page (in which a 16-in. pipe was used) is about 24 in. If you decide to increase the table's height, increase pedestal and top circumferences in direct proportion

A  
B  
C

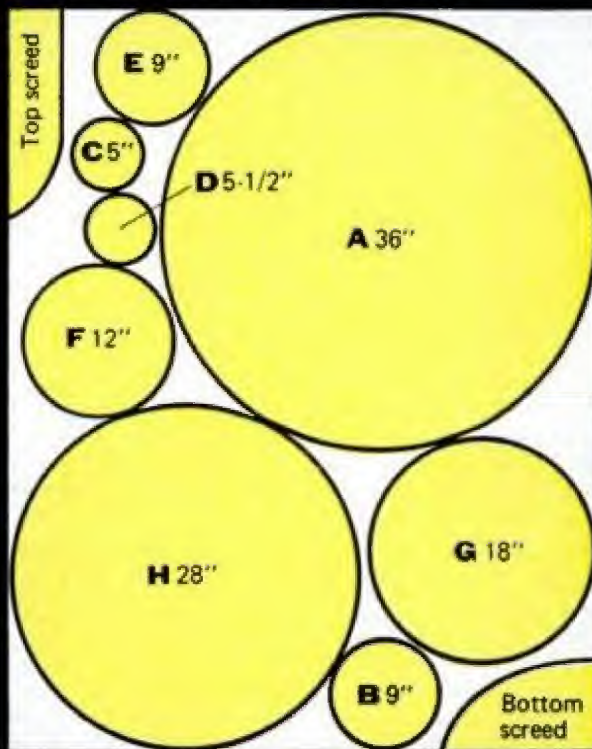


### HALF-SECTION

DIMENSIONS of the plywood discs are given in elevation at left. Discs and flanges total about 8 in. high overall. To prevent warping, exterior plywood is advisable

CUTTING SCHEDULE (right) lets you cut discs needed for a 36-in. table from 4x5-ft. piece of plywood. If you plan to use a sabre saw, mark the layout lines on "bad" side

### CUTTING SCHEDULE



3/4 x 48 x 60" plywood

Note: Dimensions shown are for disc diameters

D  
E  
F  
G  
H



**FIRST STEP** in molding gracefully curved pedestal is to fill in "steps" using plaster of paris



**FINAL SHAPE** is made by screeding patching plaster with special plywood screed built as shown in drawing

a patching plaster such as Savogran Crack Filler or Durham's Rockhard Putty. Drill a small hole through the center of each disc to form the pilot-point for penciling the circle. These holes also let you slip a nail through the plywood discs to insure accurate centering when assembling.

To assemble the discs, spread glue evenly on the first disc, center the next smaller size and put a nail in the hole. Drive the 1¼-in. No. 8 screws and move on to the next disc. When all discs are assembled, center the two pipe flanges and fasten in place with lagscrews.

You can save time and money by using ordinary plaster of paris for the initial filling. It's best to apply the plaster in two or three coats, starting with a thick mix-

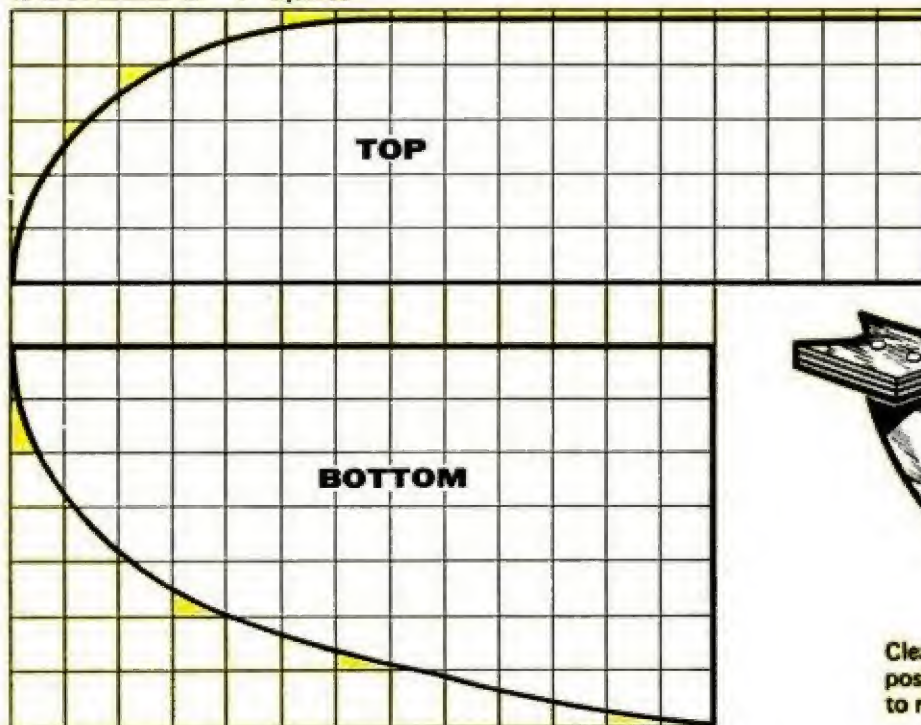
ture and ending with a mixture the consistency of heavy cream. Glob on a trowel-full and screed the shape by holding the tool (notched block) firmly against the pipe and the cleat against the plywood edge. You'll end up with the shapes quite true, but *not* entirely smooth. Do the final smoothing by laying on joint compound the same way you do when finishing a plasterboard wall.

When the plaster is dry, apply several coats of flat enamel, sanding thoroughly between coats.

If you prefer a durable top for use as a work surface, plastic laminate is a practical choice. In this case, apply a laminate self-edge strip to the plywood edge before laminating the top. ★★★

**SCREED** can be cut from scrap plywood lying about shop. Notched block at end guides screed around pipe.

**SCREEDS** 1" squares



**SCREEDS** used to shape table's contours can be cut from same plywood panel as discs (see page 163 for cutting schedule). Be sure to cut curves accurately and sand smoothly

**SCREED ASSEMBLY**





# Grinding-Wheel Dresser Assures Square Edge

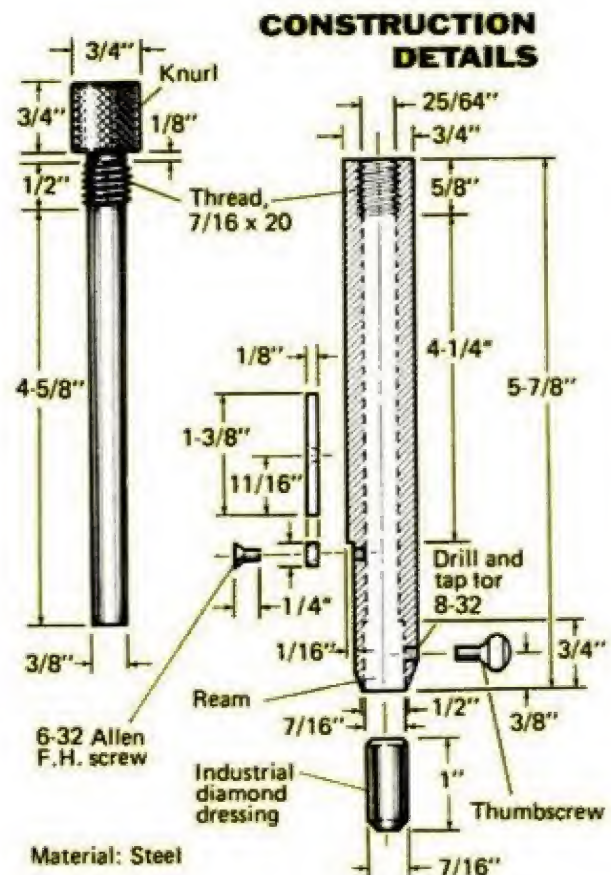
By DOUGLAS N. THORNTON

THE WIDER A GRINDING WHEEL, the more skill it takes to dress the edge straight and true freehand. That's when you'll appreciate this shop-made, diamond-point dresser which has a crossbar to guide it straight across the wheel. With it you just can't form hollows or crowns in the edge of the wheel.

Other than the diamond point, you can make it for practically nothing. I used a 25-carat industrial diamond—No. 404-026064—bought from DoAll Co., 1586 Des Plaines Ave., Des Plaines, Ill. 60018, for about \$4. If your dresser will be used constantly, I'd suggest spending a couple extra dollars for a higher quality, longer-lasting diamond.

To use the tool, you simply rest the  $\frac{1}{8}$  x  $\frac{1}{4}$ -in. crossbar against the grinder's toolrest and adjust the toolrest until the diamond just touches the stone. Finally, with the stone spinning, you move the dresser back and forth across the edge of the stone, turning the knurled knob a small amount as required. Result: a true, square-edged wheel. ★★★

APRIL 1971



# EXCITING NEW PRODUCTS

BY CATHERINE BILSKI



**"NONBREAKABLE" CL MODEL PLANE** has parts that separate without breakage upon impact, reassemble quickly. It comes with .049 McCoy gas engine and reaches speeds up to 32 mph using 20-to-25-foot control line. Cosmic Wind Trainer is \$12.98, metallized Silver Wind Trainer, \$14.98. Testor Corp., 11500 Tennessee Ave., Los Angeles, Calif.



**COOK ANYWHERE** with the Porta-Flame Heating unit. It's portable and perfect for camping, hunting, boating and picnics. Complete with protective stand that holds cooking utensils, it will give service equal to that of a small gas-range burner. Fuel is included. \$11.95 postpaid from The Joy Shoppe, Dept. BD-20, Box 2586, Pomona, Calif. 91766.



**RAINTIGHT POWER OUTLET** can be used for temporary site service and permanent home installations for pools, lights and mowers. The 120-v.a.c. S/N device has two single-pole, 20-amp. "E-Z-Red" breakers. Power outlet is list priced at \$22 from the Wadsworth Electric Mfg. Co., Inc., Covington, Ky.



**LEARN TO SHOOT LIKE A PRO** with the Basketball Training Glove. It allows the ball to rest correctly on the fingertips, prevents use of palm and builds strength, flexibility and accuracy. Adjustable for any size hand. Retail for \$2.98 from Beacon Enterprises, Inc., 230 Fifth Ave., New York, N.Y.



**AERATION** is one proven means of improving the health of your lawn and now you can handle the job yourself by strapping on a pair of sandal-like Foot Lawn Aerators. Each aerator has 13 steel spikes which protrude 1½ inches below the sole to penetrate and loosen compacted turf and soil. Product has suggested list price of \$7.95, is made by Suburban Plastic Molders, Box 9566, Baltimore, Md. 20137.



**HANDY DESK ACCESSORY** with a truly unique design is the Cube Calendar. Once its plastic cubes have been set, the month, date and day of the week are seen at a glance, with large numbers for the date appearing in bold black. The four cubes nest in a handsome cork-lined, brass-finished holder with ebony plastic base to add a decorative touch. Calendar sells for \$3.20 postpaid. Silk Art Studios, 202 Franklin Ave., Midland Park, N.J. 07432.

APRIL 1971



**DRIVE RODENTS** from stores, homes and other buildings without traps or poisons. Rat-Away emits high-frequency sound waves so disturbing that rodents must leave area. \$119.95 postpaid from RatAway Div., ADC Sales, Inc., Box 182, Fall River, Mass. 02724.



**GET EASIER AND SAFER STARTS** for your mini-bike with the Kwik-Kick starter. It features quick, easy installation on U.S.-made mini-bike engines (except B & S) of 5 hp or less, foldaway kick arm, cast and machined construction throughout. Manufactured by Colt Industries, Fairbanks Morse Engine Accessories Operation, Box 177, Beloit, Wis. 53511. Suggested list price is \$19.95.

167

# A Little Tool With a Big Bite

By WALTER E. BURTON



Though some of its blades are not much thicker than a human hair, a jeweler's saw is often the best tool to use



**LUBRICANT APPLIED** to blade helps with the cutting. Use beeswax or paraffin, or even a cutting oil



**JUST BECAUSE** they're labeled "jeweler's piercing saws" is no reason for not adapting these handy tools, with their ultra-thin blades, to other jobs about the home and shop. The fact is, such a saw and a variety of blades to fit it can be used in many ways by the homeowner, do-it-yourselfer, modeler or almost any garden-variety tinkerer.

Essentially, a jeweler's saw is a C-shaped frame holding a blade capable of cutting various materials ranging from wood and plastic to brass and unhardened steel. The blade normally is inserted with its teeth pointing toward the handle so that it cuts on the pull stroke and cleans the kerf on the push stroke. A shallow frame, one having a throat dimension of  $2\frac{1}{4}$  in. or less, is most often used for jewelry work, modelmaking and similar light-duty chores. For work where the blade has to cut to the center of a large circle, a deeper frame is necessary. In the average workshop, one saw with a  $2\frac{1}{4}$ -in. throat and another 6 to 8 in. deep will

**SAW TEETH** should be cleaned periodically whether or not wax is used. Suede-shoe brush will work fine

POPULAR MECHANICS



**TYPICAL BLADES** in pairs (from top): Nos. 8/10, 3, 14. Blades and frames are by William Dixon, Inc.



**TO PREVENT BLADE WANDER**, cut groove on underside, hold piece so groove is at cut starting point



**ON MODEL WORK**, jeweler's blade produces extremely fine cut and seldom requires further finishing



**COPPER WIRE** installed in frame can be used as lap for smoothing, increases clearance in small grooves

be adequate to handle most challenges.

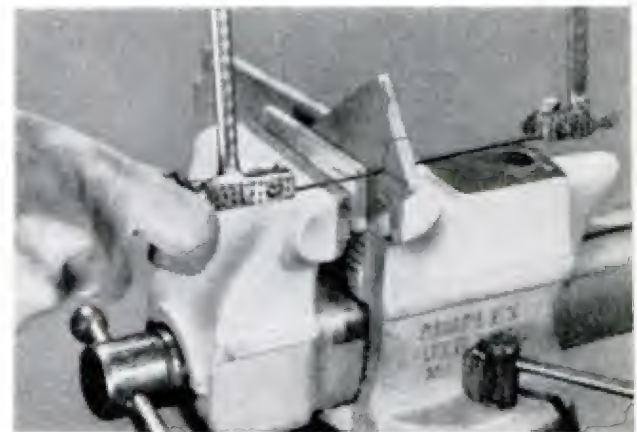
Blades, commonly 5 in. long, come in thicknesses and widths ranging typically from No. 8/0 (.006 in. thick and .013 in. wide) to No. 14 (.024 in. thick, .068 in. wide). Most hardware stores sell the blades by the dozen or the gross. The price runs about 50 cents per dozen.

Thumbscrew clamps on the frame hold the blade tips. Distance between clamps should be adjusted so that when you press the frame ends slightly toward each other and clamp a blade in position, the frame will spring back enough to pull the blade taut.

It should be noted that the degree of blade tension is often a matter of personal choice. Some craftsmen prefer more or less tension than a fellow sawyer would. A good rule of thumb is to tension the blade so that when plucked like a guitar string, it will emit a moderately high "ping."

The term "piercing" originated from the

**RIVET** can often be removed—with less damage—by slicing off projecting part with a jeweler's saw

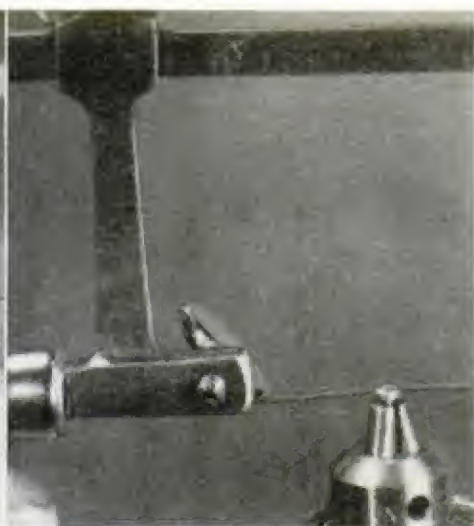


**COARSER BLADES** can be used for cutting wood, but because of set, they often do not clear themselves

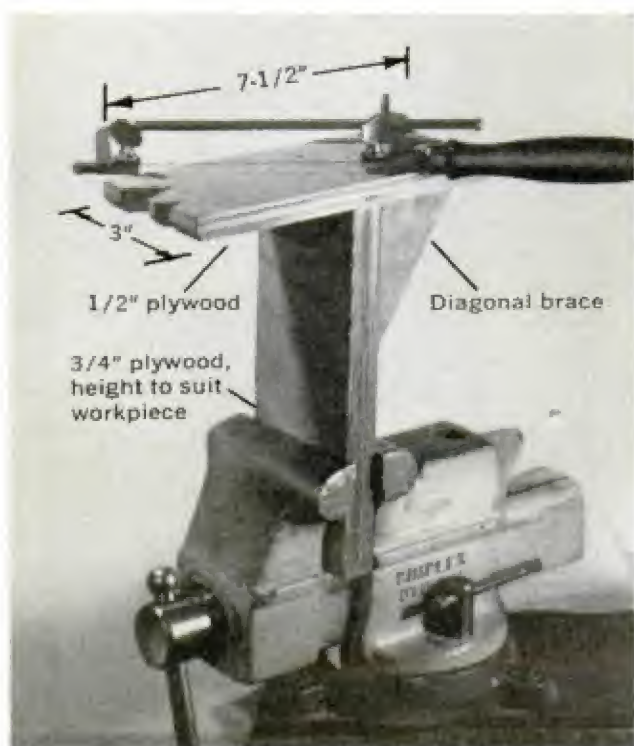




**CHUNK OF BOLT** can be whacked off (left) without leaving any burrs. Screw slot (right) that's clogged by paint or rust is quickly cleaned



**PENDANT** is easily cut from earring. Work should be held in small vise



**WORK TO BE SAWED** is normally rested on wooden bench with saw operated to cut on the down stroke



**TO CUT STRAIGHT LINE** in sheet metal, clamp parallel strips such as the lathe-bit blanks shown above

use of the tool in making delicately pierced work in metal. To do this, the blade is threaded through a predrilled hole and then used to cut an opening of the desired (usually irregular) shape. The joy you get when using these little dandies is enhanced by the fact that very little further smoothing is required.

A number of uses for a jeweler's saw are illustrated on these pages. As the pictures show, they can be used on such jobs as jewelry work, light wood and metal-cutting jobs, centerhole cutting and shortening bolts.

As with conventional hacksaw work, more effective cutting action can be maintained if the blade is kept lubricated. You may find that wax tends to trap chips between teeth, thus slowing cutting action a bit, but it does reduce friction and thus increases blade life. One source for frames and blades is William Dixon, Inc., 32-42 Kinney St. Box 89, Newark, N.J. 07101. The 2 1/4-in. shallow-frame saw shown sells for \$2.85. ★★★



**OPENING** can be cut in the center of a large piece of work by first drilling pilot holes at four corners



# New tools you should know about



**MASONRY CUTTING BLADE** can be used in portable electric saws with  $\frac{1}{2}$  or  $\frac{5}{8}$ -in. round and diamond-shape universal arbors. The blade shown, as well as a metal-cutting version, is offered in 6,  $6\frac{1}{2}$ , 7 and 8-in.-dia. sizes at prices from \$2.90 to \$3.45. For dealer information write the New England Carbide Tool Co., Industrial Park, Peabody, Mass. 01960.

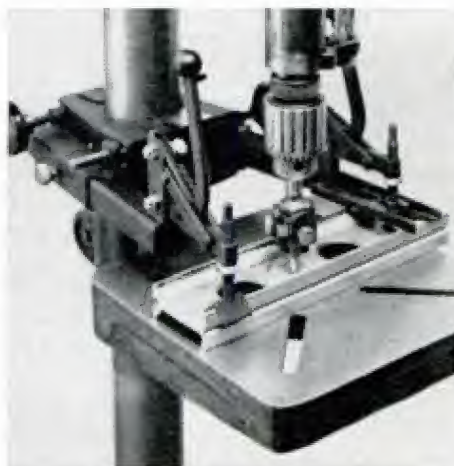


**BRAKE-SWITCH** for stationary power tools boasts an automatic return to off that instantly stops motor when brake position is released. For 110-120-v. a.c. motors to 10 amps. it sells for \$15 plus postage. Ambi-Tech Industries Inc., 861 Washington Ave., Westwood, N.J. 07675 makes it.



**ELIMINATE REACHING** when small metal parts drop into hard-to-get-at spots by using Extend-o-mag. The handy 5-in. tool fits in your pocket like a pen; extends to 18 in. Available from United States Magnet, 1108 S. Western Ave., Los Angeles, Calif. 90006, for \$2.95 postpaid.

**ATTACHMENT** designed to fit all drill presses, can be used for horizontal or vertical (far right) workholding. Named Fas-Set, it can be adjusted to various widths on a drill-press table; arms are adjustable forward and back. Tension springs hold it in position; two adjustment-screw handles lock it in place. Unit has five interchangeable hold-down accessories for all types of work, large or small. Price: \$39.95 postpaid. George Manville, 35520 Oak Glen Rd., Yucaipa, Calif. 92399.



**PROPANE-TORCH LIGHTER** is permanently mounted on the torch head, uses piezoelectricity to ignite the gas when the snap hammer is triggered. When released, hammer delivers a sharp blow to a piezoelectric crystal, causing a high-energy, shockfree charge to travel along electrode to the spark gap inside the burner head, giving instant flame. Price: \$2.98. Piezoelectric Div., Gould, Inc., Bedford, Ohio 44146.



# HINTS FROM READERS



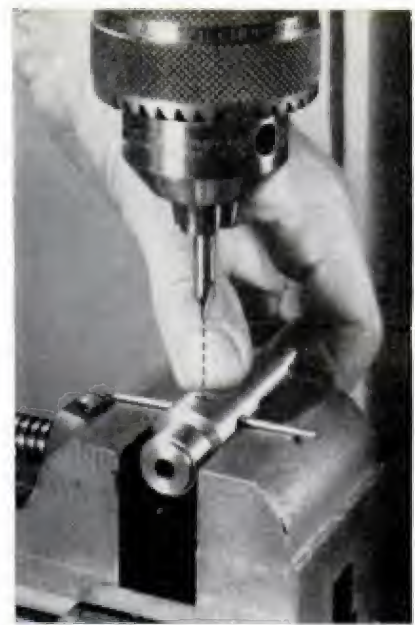
## More torque

If you drill a 1/4-in. hole through the handle of a screwdriver or nut driver, you can insert a length of rod for better leverage. A piece about 4 in. long works fine and will fit your hand well.—*William Newton, La Mesa, Calif.*



## Homemade prying tool

By grinding the short leg of an Allen wrench to a form like that of a crowbar claw you can make a handy tool for removing staples and the like. If needed, after shaping, re-harden and temper tool.—*W. B. May, Oak Park, Ill.*



## Right-angle hole

A timesaving trick on many occasions is use of a slender rod to position work in which a second hole is to be drilled at a right angle. Position workpiece in drill-press vise as shown and drill hole.—*W. E. Burton, Akron, Ohio*

## Faster cleanup after those hand-dirtying jobs

Any time you tackle gardening chores or automotive repairs, you stand a good chance of heavy dirt accumulation underneath your fingernails. I've found that by scraping my nails across a cake of soap before starting such work, the following cleanup goes a lot easier. To remove soap, either pare lightly with a nail file or scrub with a hand brush as you wash.—*D. Y. Harada, Seattle, Wash.*

## NEXT MONTH IN SHOP AND CRAFTS

**SPECIAL 20-PAGE HOME-IMPROVEMENT ROUNDUP** shows how to get more living space by building an addition and offers 20 construction tricks the author learned while increasing his own living area. Bonus: Some not-too-well-known products that will give your work a professional look. Pick up a May *PM* and add to your know-how.

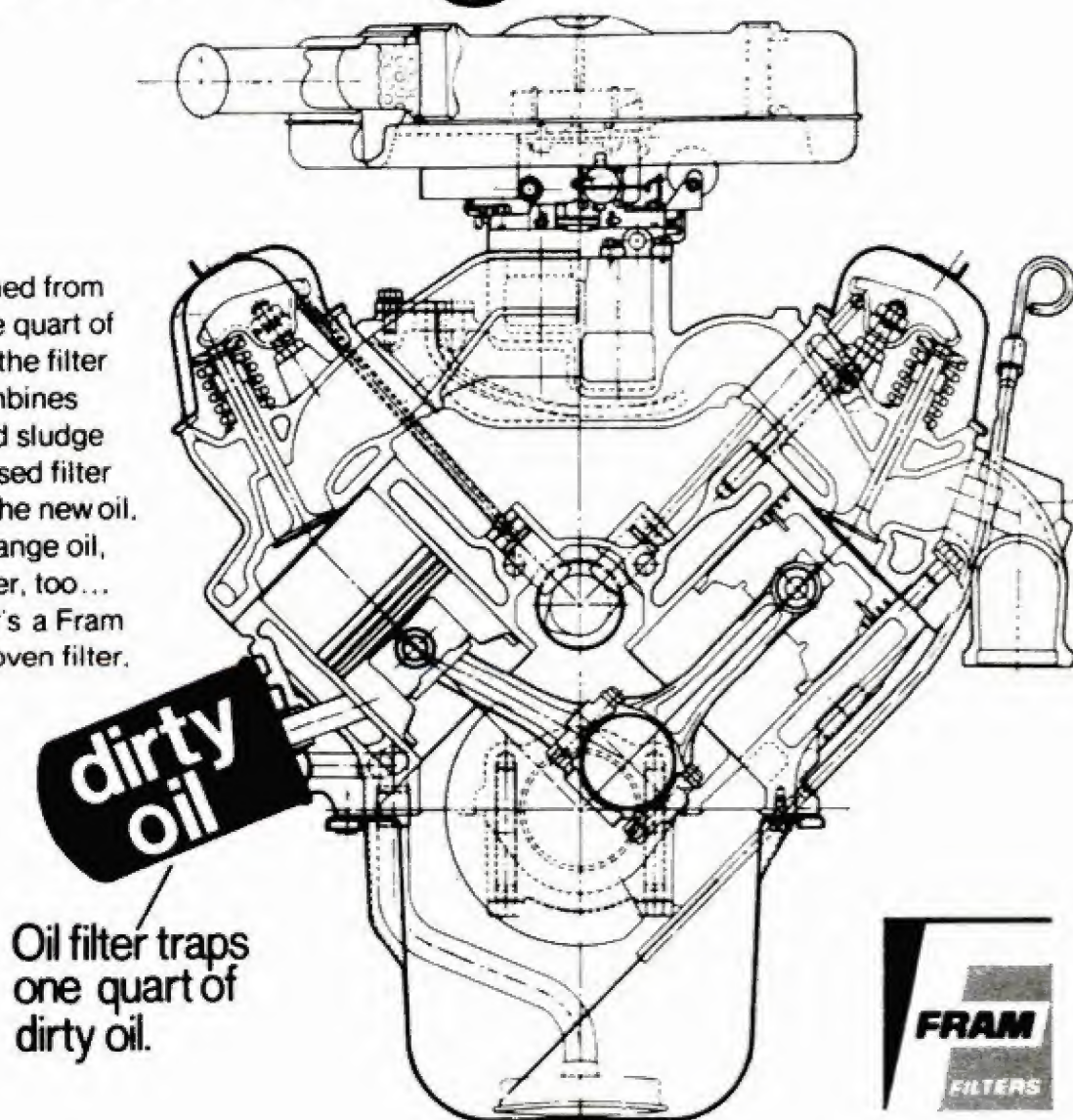
**MAKE A CENTER INDICATOR FOR LATHE WORK.** *PM's* version is based on the lever principle, and using it saves time when you're centering work in an independent-jaw chuck or on a faceplate for accurate hole drilling. You'll find complete instructions and plans for making your own in the May issue of *PM*.

**QUICKIE PROJECTS FOR THE FUN OF IT.** There's something for each member of the family in this five-project collection. For the home there's a brain-teaser puzzle, colonial cutlery cupboard and a bookshelf occasional table. For the youngsters, there's a back-yard roller coaster and, for those who delight in turning things on, a switch-box toy. They're all in *PM* next month.

**LIGHT IT—AND YOUR BARBECUE'S READY.** With a gas barbecue you can say goodbye to briquets, hard starting and ash cleanup. And, happily, installing one of these units is a lot easier than you might think. You'll learn how in the May *PM*.

# Unless you change the oil filter with an oil change, a quart of dirty oil stays in your engine!

When oil is drained from a crankcase, one quart of dirty oil stays in the filter. This dirty oil combines with grit, dirt and sludge trapped in the used filter to contaminate the new oil. So when you change oil, change your filter, too... and make sure it's a Fram performance-proven filter.



Oil filter traps one quart of dirty oil.



**EACH SWING ASSEMBLY** is hung (photo above) from conduit hanger rods which fit between supporting legs

**CROSS BRACES** for the supporting framework (photo left) are bolted securely to the four legs with nuts

## OLD-TIME YARD SWING

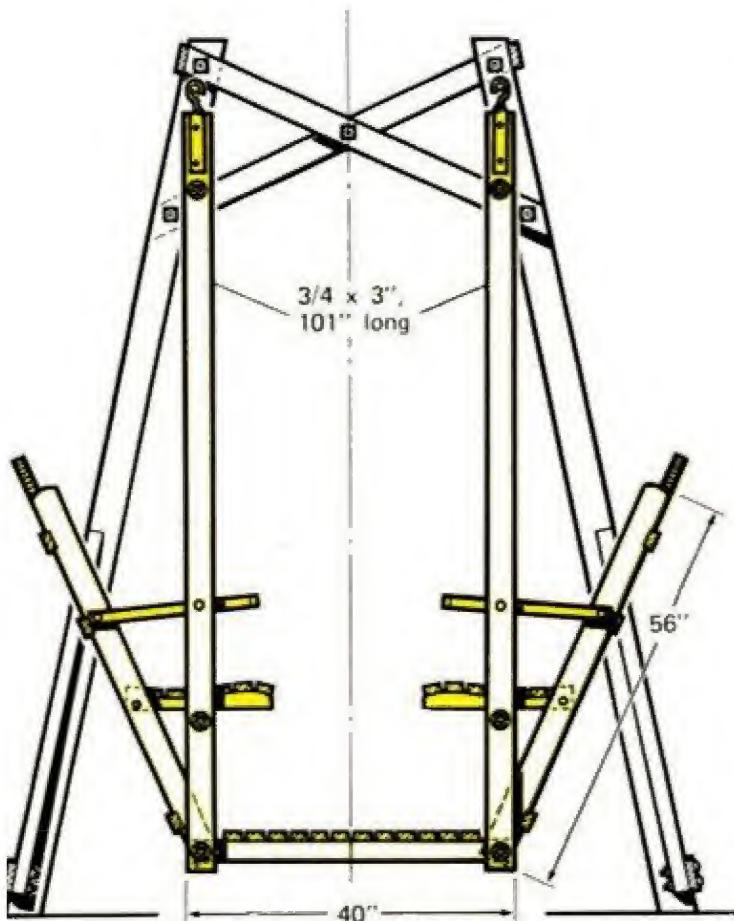
*(Continued from page 142)*

shown in detail A. Standard  $\frac{3}{8}$ -in. Redi-bolt rod is used inside the conduit. Carriage bolts are used to secure the cross braces.

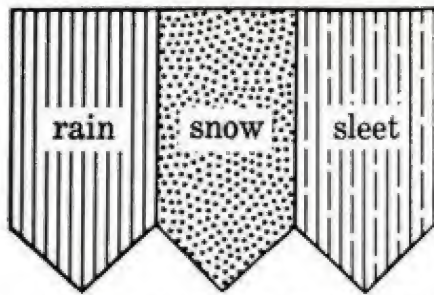
Each swing is made alike and you can make both quickly by cutting two of everything. Start with the backs, then the seats. You'll notice that three conduit rods are used for each swing-seat assembly which serve primarily as spreaders. The separate platform assembly hooks over the bottom one and the seat rests on the middle one. The notched ends of the platform actually insert between the uprights and the seatback members. Each swing is suspended by two straps that are bent from flat iron. A little grease on their conduit rods will keep the straps from squeaking.

The canopy is optional, although it does provide shade and adds a colorful touch. You make the supporting wood framework as shown and then tailor a canvas cover to fit it. Four screws down through the cross members of the wood frame are used to anchor the canopy to the swing.

Give your swing a couple coats of good-quality exterior paint. You can paint the platform to match the stripes in the canopy if you wish. ★★★



SIDE VIEW



Pick a real beast of a day. When it's snowy outside, or rainy, or icy.

Take your own car, and taking your own sweet time, drive cautiously to your nearest Renault dealer.

Then slide behind the wheel of a Renault 16 and see how little sliding you do after that.

Hit the brakes on a rain-swept street and the front-wheel disc brakes stop you as straight and true as an arrow.

Go into a turn and the front-wheel drive anchored down by the weight of the front engine pulls you through lovingly. Predictably.

While you're in that turn, savour the sweet, tight precision of rack-and-pinion steering. What you don't need on mushy roads is mushy steering.

And don't bother swerving to avoid any bumps. Because all four wheels are independently suspended. So only the wheels get bumped, not the entire car.

When you feel all these things, plus a few we haven't even mentioned, working together, you'll know you're in a machine that marries you fiercely to the road. Even on surfaces that turn other cars into giant skates.

Remember our invitation the next time the weatherman says it's going to be good and rotten outside.

In fact, since the Renault 16 handles the way it handles, the rottener the day, the better we like it.

**Test drive a Renault 16  
on a day you'd rather  
not drive your own car.**



# ROAD LOVE

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Up to 30 mpg. 12 mos. unlimited mileage warranty. \$2495 suggested P.O.E. Taxes, freight, options (such as automatic trans., sun roof, etc.) and dealer delivery charges additional. For overseas delivery information see your nearest dealer or write Renault Inc., 100 Sylvan Ave., Englewood Cliffs, N.J. 07632

## 10 DRIVING TIPS

*(Continued from page 73)*

some maneuvering room between your car and the car ahead, it can save your life.

**8. Get Disabled Car Off Road!** Driving on public roads is a "social" activity. At best, the driver of a disabled car snarls traffic, thus shortening tempers of scores of other drivers and also slowing the arrival of a tow truck trying to reach him. At worst, the disabled car, its driver and occupants go up in a ball of flames when smashed from behind. Get your car onto a shoulder as soon as possible. One trick is to put your car in gear and use your starter motor to "crank" out of the flow of traffic. This can only be done, of course, when the starter motor can be cranked with the car in gear. If it can't, get out and push!

**9. Shake Tailgaters!** What do you do when a "pusher" is sitting on your tail? First, make sure you're not dreaming along in a passing lane you shouldn't be in. If you're not and you're above the *minimum* speed posted for the road and the tailgater is pushing you to go faster because he has no other way of passing, then you are justified to hold your lane and speed. It is best, however, where possible, to just ease to the right and signal him to pass. Don't take his pushing personally. If it isn't possible to let him pass, put on your hazard flashers. He'll know you're warning him, or you're actually having trouble and are going to stop, maybe suddenly. If he was dreaming that'll wake him up. If he's belligerent, he'll worry that a patrol car will spot his tailgating. Unfortunately it's illegal to blink flashers in a moving car in some states. It's a law that needs changing since it should be legal to signal danger. Being able to drive with flashers on in fog is another example.

**10. Run Best Tires on Rear!** If you even have to think about where to put the poorer set of two pairs of tires, you probably need new ones. But the latest word from some tire manufacturers regarding this controversial subject is to put the better pair on the rear. The reasoning is that as the front tires steer, the rear tires must be able to follow. If they don't have sufficient tread for the necessary traction to follow the fronts, the rear end of the car will begin to slide out, and may result in a dangerous spin. ★★★

## MUSCLE FOR LITTLE TRACTORS

*(Continued from page 115)*

ternational model C-60, four-cylinder "L" head, water-cooled (9¾ quarts), 59.5-cu.-in. displacement, quieted with a better muffler and upped in rated speed from 1800 rpm to 2000. International points out, however, that horsepower is not as important as torque and that the Lo-Boy's engine will deliver its peak torque at 1700 rpm.

The company also stresses this is an all-gear tractor with a time-tested (you clutch and shift) transmission. The independent PTO delivers 1800 rpm, the basis for International's claim that the 60-inch snow thrower can cast snow 25 feet. Hydraulic lift is standard and a hydraulically actuated three-point hitch is optional. A 42 or 60-inch rotary mower can be used with the Lo-Boy. The 42-inch rotary tiller is powered from the PTO through a universal gearbox and chain drive.

The Lo-Boy's low center of gravity gives it the stability needed for side-hill mowing and, if necessary, more can be gained by adding dual rear wheels. This tractor's weight makes no impression on tender turf if it's equipped with high flotation tires, front and rear. ★★★

## Keep Your Copies of PM

**W**HERE did you see that article on making a power hacksaw? Now that you're ready to build a screened patio, where's the *PM* article that tells you how? You vaguely recall seeing a great idea for lifting a tilted section of concrete walk—but in what issue?

If you already are saving copies of *PM*, it sometimes may be frustrating to have handy such authoritative information and useful ideas, yet have difficulty finding a particular

article when you're ready to go to work.

In December, *PM* will make available an inexpensive *Annual Index* combined with an attractive shelf cover to hold all 12 issues of 1971. Whenever you want to refer to an article you slip off the cover and check the "Instant Index" that's bound inside. Thoroughly cross-referenced, it will help you find any of the hundreds of valuable *PM* articles in seconds. If you're not already saving *PM*:

- Start saving your copies now.
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# CHANNELLOCK

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Ask any good mechanic. He'll tell you his CHANNELLOCK tongue and groovers are the handiest pliers he owns. Try one . . . you'll agree. A word of caution: be SURE you're getting the original, genuine CHANNELLOCK. It's the only tongue and groove plier with machined, smooth working, undercut channels that never jump out. Look for the CHANNELLOCK trade mark on the handle. GET ALL THE FACTS. Send for our catalog . . . yours for the asking.



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## 'BARGAIN BASEMENT' HABITAT

*(Continued from page 107)*

that whenever I glanced toward the windows or viewing dome I could see a fine mist in the air.

A thermometer on the wall reported the inside temperature at 68°F., fairly comfortable even in a wet suit. I asked Doug Elsey if he knew the water temperature.

"It's 63°," he said. "Our body temperature accounts for the difference. *Sublimnos* isn't heated today, but we do have a heating system—" he pointed to a cabinet that resembled a window air conditioner—"which we use in the winter so we can make under-ice dives."

Elsey is a graduate student in ocean engineering at Florida Atlantic University, and is the guy who was responsible, last summer, for the physical operation of the habitat. He volunteered that he was working for peanuts—barely enough to pay his living expenses—but felt richly re-

---

**We do have a heating system which we use in the winter so we can make under-ice dives.**

---

warded in the experience he was acquiring.

Doug saw me looking at some half-burned candles stuck in the foam insulation that covered the walls. He grinned. "Those are left over from my birthday party down here, complete with cake."

*Sublimnos* was born in a New York restaurant on a blustery day back in 1968. While eating lunch, Dr. MacInnis was mentally bemoaning the lack of a habitat in Canada, or a habitat *anywhere* that could be used by students and young scientists. He found himself doodling on his napkin, and soon had sketched the world's first underwater Volkswagen.

He took the sketch to a New York engineering firm, where a young engineer noticed that its shape and dimensions were similar to an existing railway ore carrier. They decided to modify the carrier (which was built of 3/4-inch steel), and then spray the inside with two inches of foam plastic for insulation. Sparse furnishings were added, and the structure was joined to its bottom half, which is nothing but a steel cylinder filled with 10 tons of iron-ore ballast.

*Sublimnos* was sunk in the chill waters of the Great Lakes on June 24, 1969, near Tobermory, Ont. Tobermory is at the tip of Bruce Peninsula, which separates Lake Huron from Georgian Bay. Within one

year it had served as a research base for the scientific programs of more than 10 universities and other institutions, and as the testing base for stacks of new diving equipment.

The habitat is hooked to four umbilical cords—a compressed-air line, a hot-water hose, a communications wire and a 12-volt power-supply line. These lines run from a log structure ashore (which houses a generator, compressor and heater) out to *Sublimnos* and up through the hatch.

Halfway between shore and the habitat is another and even simpler underwater structure nicknamed the "telephone booth." Actually, it is nothing but a plastic dome on top of five-foot steel legs. It has no life-support system, but two divers can come up with their heads inside the dome, purge it of water or foul air with the air supply from their own tanks, and then talk over their scientific findings or diving problems in normal voices and with some degree of comfort. It's a microhabitat, a bubble of air for the heads of two divers.

Embellishing on this idea, Dr. MacInnis has developed another microhabitat consisting of a bubble dome connected to a lower platform by cables. The whole package collapses very neatly. Underwater, the diver feeds compressed air from his tank into the bubble, which rises until the cables are taut. If the diver wants to move a heavy object underwater, he can maneuver the platform under it, continue to "inflate" the bubble until the whole rig has neutral buoyancy, and then swim anywhere with it. It also can be used, of course, for communication, in the same sense that the "telephone booth" offers facilities for normal conversation.

These little habitats, including *Sublimnos*, have pointed the way to the development of others. Volkswagen-type habitats are currently under construction at Memorial University, St. John's, Nfld.; at Freeport, Grand Bahama, and several other places.

By the time you read this, the sleepy community of Tobermory will boast the world's first underwater village. Two other habitats will have been sunk in the general vicinity of *Sublimnos*. I saw one of them, a historic structure. *SPID* (Submersible Portable Inflatable Dwelling) is an "underwater tent" on loan from its developer, Edwin A. Link. In 1964, Jon Lindbergh and Robert Stenuit made a record "saturation" dive to 432 feet in *SPID*, remaining at that depth for 49 hours.

The other underwater house is known as *Igloo* (because of its shape), and was developed by Dr. MacInnis. It, too, is with-

*(Please turn to page 180)*





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## 'BARGAIN BASEMENT' HABITAT

*(Continued from page 178)*

in the financial reach of any university or similar institution. Built for only \$15,000, Igloo is a transparent plastic sphere, eight feet in diameter. From inside you can see in any direction, even underfoot.

"We'll probably leave Igloo in Georgian Bay for about a year," says Dr. MacInnis. "Then we'll haul it to Resolute Bay in the Northwest Territories, where we'll sink it through the eight-foot layer of ice. Igloo will become the world's first Arctic habitat."

The little underwater village off Tobermory shows that man can work, study, observe and even enjoy a birthday cake or a Christmas tree beneath the seas. SPID helped prove, long before its arrival at Georgian Bay, that divers can perform in and from a habitat at great depths and for long periods. The ugly little *Sublimnos* has effectively proven that divers can live underwater at very little expense. And Igloo, Joe MacInnis hopes, will prove that man can operate from a bubble of air in the bone-chilling waters of the Arctic.

He is a man of considerable depth, this Joe MacInnis. "The impact of any dive can be profound," he says. "In July of 1969 I visited Cape Kennedy and watched friends of mine blast off for the moon. Later I flew home to Toronto, then felt an uncontrollable urge to head for Tobermory. There I made a night dive down into *Sublimnos*. The weather and water were clear and I could look up—up through the transparent dome, up through the heavy column of water, up through the atmosphere, past the edges of space, to the brightest of moons, where my friends were walking at that very moment.

"I felt that I had a window on the universe. It was an experience both profound and exhilarating. Countless young men, in the future, will make dives that will affect their lives and attitudes just as deeply."

Thanks, in part, to an ugly little Volkswagen habitat in the chill waters off Tobermory. ★★★

## THE INCREDIBLE SKYSHARK

*(Continued from page 80)*

it a breeze for sportsmen to land and take off from back-country lakes only 2000 feet long.

Skyshark has a military potential. As a fighter, it could operate in forward areas, from either land or water bases. And space engineers are taking a close look at the Gioia wing for its possible use in the huge space shuttle now under design for NASA.

Designed into larger planes for passenger and cargo use, the wing would make it possible to operate from short "downtown" airstrips.

This revolutionary wing could even improve the performance of jetliners. It would permit the big planes to take off and land at much slower speeds, carry greater loads—and produce only about 50 percent of the crashing thunder we're so aware of today. That would be a fringe benefit—especially for unfortunates who happen to live on the fringe of a major airport. ★★★

## THOSE 4-CYLINDER ENGINES

*(Continued from page 97)*

der heads. In that same period of time English Ford's 1350-cc Consul, with 57 hp, has been upgraded to the current Cortina line—now with 1600 cc and 68 hp. This is the trend with just about all the manufacturers. They realize our "fast" road system puts demands on engines never seen in Europe's "tight" road system.

Air filters are also an important factor in this picture, too, believe it or not. Five or six years ago most European cars had crude wire mesh filters on the carburetors—that hardly even slowed the dirt going into the engine. This abrasive dust caused faster wear of rings and cylinder bores. Today these engines are using modern paper filters like those on American cars. The same is true for oil filters. A few years ago many foreign engines used old-style felt, or textile, filter media. It clogged up in a few hundred miles, and for the next few months you were running, in effect, with no filter at all. Bearings wore fast. Today most foreign cars use modern screw-on paper oil filters, as on American cars. And they get twice the bearing life.

Another factor is valve life. High loads, with accompanying high cylinder pressures and temperatures, tend to burn and erode the valves fast—especially exhaust valves. But this doesn't need to mean short useful life. American truck engines run at maximum power and revs most of the time, and their valves last 100,000 miles or more. It's a matter of the quality of materials you put in the valve. Good high-temperature steel alloys (with chrome, nickel, silicon, tungsten and the like) will give almost unlimited valve life in an engine, even at full power. The European cars didn't have the materials. Not because the manufacturers were cutting corners, but because they didn't fully understand how strenuous our driving conditions were. Here, too, many improvements have been made in recent years. ★★★

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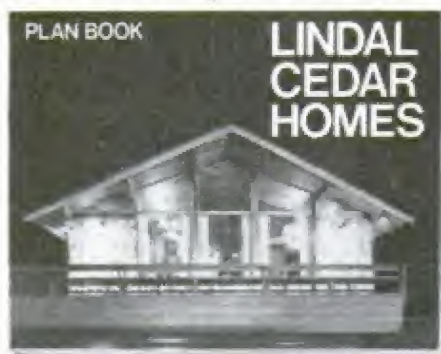
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## NEWS BRIEFS



### Getting up steam

English sailor Alan Hogarth, 33, is in training for—of all things—a race with a car. He figures that with a little streamlining, his "sea boots" will enable him to travel faster through water than a car can travel through traffic.



### Flavorful smoke

Operating just like the universally known water pipe, the "whiskey pipe" enables the smoker to inhale smoke that has traveled through his favorite alcoholic beverage. The liquid has a filtering action—and also adds its distinctive flavor.



# Wide-Stance Super Suspension

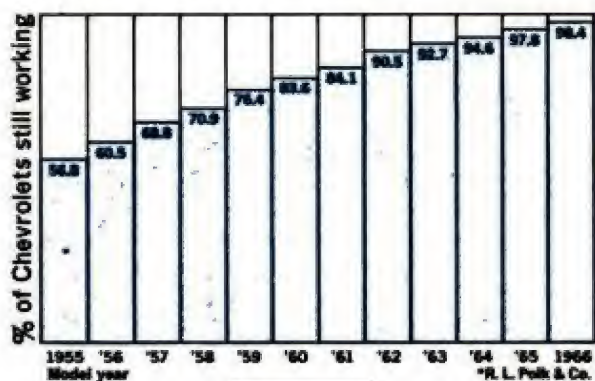
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The chart at right, based on latest official figures\*, shows how Chevrolets outlast other trucks. Going back as far as 1955, for instance, over 56% of the Chevrolets of that model year are still on the job. No

competitive make has as many as half of its 1955 models still working.



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## No longer shockproof

A cow whose horns "insulated" it from electric fences kept breaking the fences. Its owner added an antenna that picks up the jolt—and now the cow remains corralled.



## Hammock built for two

Two can sleep comfortably in a new jumbo hammock that's 15 feet long. It's sold by Hammock Master in New York City.



## Overloaded, but still afloat

Ninety-nine girls and one lucky man crowd into Qantas Airline's new jumbo liferaft. The raft would carry 40 in actual emergency use.

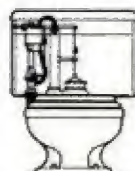


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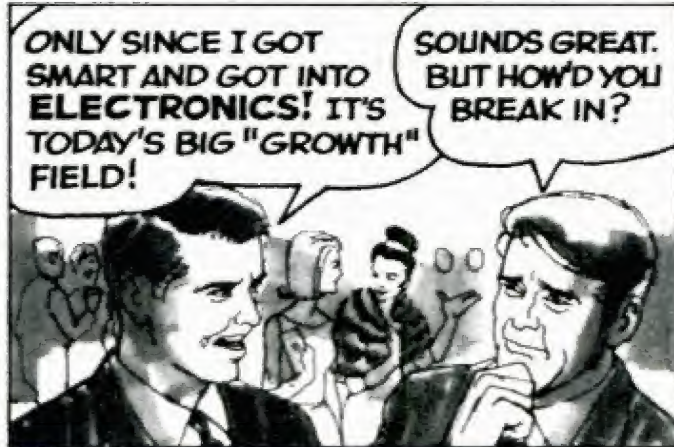
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PM-52

ONE BILLION TONS OF GARBAGE are generated in the United States each year—much of it needlessly wasted and valuable. Aluminum, for example, is only one-third of one percent of the total waste, yet has a reclaimed value of \$200 a ton. Ways to solve litter and pollution problems and to conserve natural resources lie in reclaiming and recycling all scrap and waste. . . .

NEW YORK, N.Y.—A total-recycling plant which takes in garbage and gives out saleable materials should begin operation in just two years, according to the National Center for Solid Waste Disposal, Inc. (Actually, the proposed plant is the Aluminum Assn. project. But, the National Center—1625 I St. N.W., Washington, D.C.—a nonprofit privately funded corporation, aids organizations in advancing waste disposal technology. And in this case, the National Center has helped the Aluminum Assn. to evaluate its recycling program and to disseminate information.) Not only will the plant dispose of garbage effectively, but it will also operate at a profit—producing marketable reclaimed aluminum, other ferrous and nonferrous materials (including plastics), glass, paper fiber, steam and sand. The plant—on a site yet to be determined—will meet national air and water pollution standards and operate as follows:

1. Garbage (up to 500 tons daily) is unloaded into two hoppers.
2. Garbage is processed through vertical shredders or moves on to the storage pit.
3. Shredded material is conveyed to the fiber reclaim area—where fiber is recovered in pellet form.
4. Overhead magnets in the receiving area remove ferrous materials from shredded refuse which moves on to other parts of the plant for processing.
5. Raw refuse goes to two incinerators to burn. The excess steam can be used.
6. Shredded refuse is loaded into a pyrolysis feeder (for chemical cleaning) then into the kiln where it is ignited and combusted in an oxygen-free atmosphere.
7. This residue goes to a processing unit along with the incinerator residue and is processed for reusable materials.

HIALEAH, FLA.—Recognizing the value of reclaimed aluminum and the problem of handling bulky aluminum cans, Falcon Products, Inc. has developed a quick-action can flattener. This is essentially two boards fastened by a special hinge which also holds the can in place while it's flattened. All it takes is one downward stroke. Thus, the device resolves storage problems, encouraging the salvage of aluminum cans. So, save your aluminum cans and write: Falcon Products, Inc., Box 331-K, Hialeah, Fla. 33011.

DO YOU KNOW about some action being taken to fight pollution that we don't know about? In your community? On the job? Tell us about it. Write Environment Editor, Popular Mechanics, 224 W. 57th St., New York, N.Y. 10019.

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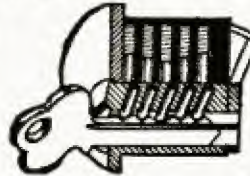
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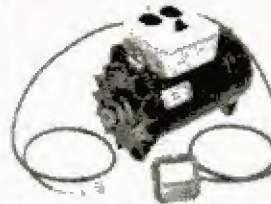
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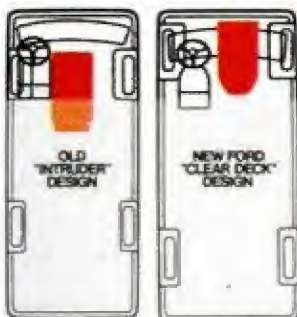
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## FORD ECONOLINE VANS



# HOMEOWNERS' CLINIC

BY W. CLYDE LAMMEY

## Mildew or dirt?

*I've been told there is a simple method of determining whether what looks like mildew is actually that or something else. Can you outline the procedure? Painted wood siding on my home shows a spotty, dark brown casting in places, especially on the north exposure. Incidentally, are mildew-proof paints effective?—W.T., Miss.*

One way is to apply a laundry bleach to the spotty coating. If it's mildew, the spots will lighten appreciably but won't come off entirely without a lot of rubbing—even then, some discoloration will remain. If the coating is ordinary dirt or the oily-black variety, such as that from an oil-burning heating unit, the bleach will remove it entirely, with no noticeable change in color.

I don't know that any manufacturers describe their paints containing inhibitors as "mildewproof," rather than "mildew-resistant." Under average conditions these paints are effective in reducing mildew formation, if not in preventing it entirely.

## Replacing oil with electric heat

*I contemplate replacing my old oil-burning furnace with an electric furnace. I want to use the original duct system, both cold and warm air. I'm told this is not advisable and that I should install either baseboard or ceiling electric units. Will use of the original duct system give me satisfactory service?—T.L., Ind.*

Assuming that your home is properly insulated and there are no other determining factors, the electric furnace should give satisfactory service. Using the original duct system may lower the initial installation cost somewhat, but you should get comparative cost estimates on various types of electric heating installations before you contract the job. With the original duct system the furnace will usually be of the forced-air type; that is, you will have a blower operating in the same manner the forced-air oil-burning unit did.

In this type installation, I suggest you include an electronic air cleaner in the cost estimate. It will eliminate circulation of dust, lint and the finer particulates. While it must be cleaned periodically during the heating season according to manu-

facturer's instructions, this is no difficult or lengthy chore. Such units do not have throwaway dust filters, as do those in your oil-burning unit. Rather, the "filters" are cleaned as directed and reinstalled in the same order as removed.

I'm assuming that your home is of average size, of good construction, properly insulated, and that there are no other factors peculiar to the structure that would make an electric-heat installation inadvisable. Your contractor and local public utility are in a better position to advise you than I at such long range.

## Refinishing a rush seat

*I have several rush-seated chairs (not antique). The artificial rush seats show "wear," seeming to be a peeling of the coating. I used a light stain on one seat, but the worn spots darkened so much that they seem worse than before. How can I match the original coating so the repair won't show so prominently?—A.T., N.Y.*

From your description, it probably would be best to mix your own stain, using painters' oil colors or, better yet, artists' oil colors. You must be especially painstaking when mixing two or more colors to get an exact match of the old coating.

Squeeze only a small quantity—a little goes a long way—of each color into a suitable container, add a few drops of turpentine and mix thoroughly to a heavy paste. Add a bit of one color or the other until you get a match with the old finish. Apply with a soft cloth. When dry, if the color doesn't quite match, rework the original mix with a trifle more of one or the other color and reapply, successively if necessary, until you get as perfect a match as possible. Allow it to dry thoroughly—48 to 72 hours—then apply a semigloss varnish, preferably spray from an aerosol container.

If the seat is rough, go over the rush with medium steel wool before applying the stain. Brush away all loosened debris.

## Do ants damage peonies?

*Last blooming season my peonies, particularly the blooms, were covered with black ants. Apparently they did not harm the blooms but do they damage the plants? Should I spray or dust to keep them off?—R.O., Neb.*

Ants are present because of the sweetish excretions of the flowers, particularly the developing buds. They cause no damage to buds, blooms or plants so there's no reason to use insecticides. ★★★



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A scenic photograph of a forest waterfall. The waterfall flows over dark, mossy rocks into a pool of water. The surrounding forest is lush and green. In the foreground, a pack of KOOL cigarettes is prominently displayed, partially submerged in green grass. The pack is white with a green band across the middle containing the word 'KOOL' in white. Below the band, 'Filter Kings' is written in a cursive font. At the bottom of the pack, it says 'MILD MENTHOL CIGARETTES'. Three cigarettes are visible protruding from the top of the pack. The overall scene is fresh and natural.

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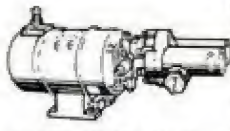
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HI POWER From your car's alternator. 110 Volts D.C., to operate power tools, lights, appliances, up to 2000 watts. Small easily connected device. Not for units with transistor regulators. \$25.00. Dale's Auto Service, Box 244, Quanah, Texas 79252.

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BE YOUR Own Ignition Expert With IGLIT. Q-Arc, Box 47876, Los Angeles, California 90047.

JEEP Owners—V8 conversions. Read Jeep Owners' ad, page 194.

## SNOWMOBILES

SNOWMOBILE Hop up accessory CATALOG. Speed and performance equipment—manifolds, exhaust systems. Send 25¢. G.E.M. PRODUCTS, Box 845, Carol Stream, Ill. 60187.

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PICKUP Camper, Trailer or Pickup—Cover . . . Build yourself. Save! Complete plans \$3.95 each Cover plans \$2.00. Conversion Plans—econoline type van \$2.95; passenger bus or delivery van \$2.95. Satisfaction Guaranteed. Equipment catalog \$1.00 (refundable). Details 10¢. Viking Camper Supply, 99-F Glenwood, Minneapolis, Minn. 55403.

BUILD Your Pickup Camper. Precut kits, blueprints and supplies. Literature 25¢. Comstock Camper and Trailer Supply, Dept. 664, Parsons, Kansas 67357.

## MOTORCYCLES, BICYCLES, MOTORSCOOTERS AND SUPPLIES

MINI-BIKES. Motorcycles. Lawnmowers. Parts. Tires. Catalog 35¢. Loren Products, Danville, Illinois 61832.

MOTORCYCLE Turn Signals. Accessories Catalog 35¢. Houston PM Lockport, Illinois 60441.

BUILD "Popular Mechanics" MINIBIKE featured June 1967 issue. Detail plans, photographs \$2.50 refundable. Kits, parts, engines; factory discount prices. Catalog 25¢. Gilliom Mfg.; PMC; St. Charles, Missouri 63301.

BARGAIN PRICES. Every part, Kart or Mini-bike. Giant Catalog \$1.00. New, "how to" plans \$1.00. Both, \$2.00. Brown's Motorsports, 19P Central St., Worcester, Mass. 01608.

ILLUSTRATED Catalog 25¢. Parts, Accessories. Custom Stock, most makes, models. Cycle Supply, Box 192M, Fairbury, Ill. 61739.

INDIAN PARTS. Rebuilding. Accessories. Indian Motorcycle Sales, Kansas City, Missouri 64127.

SERVICE Your own bicycle, or mini-bike. New Books from Sincere Press, Box 10422, Phoenix, Arizona 85016.

CHOPPERS—Complete Front Spool Wheels. Rim. Hub Chromed. Laced Trued With Tire Tube \$49.95. P.O. Box N, Mojave, Calif. 93501.

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HONDA, \$25.00. Other Bargains Send 50¢. Motorscooter, P443, Bend, Oregon 97701.

(1) MINIBIKE Plans \$1.00. (2) Minibike goodies \$15.00 in coupons, send \$1.00. (3) Minibikes, sell two get one FREE. Send \$1.00 for details. All three \$2.00. Refundable. Winston Distributors Inc., Dept. PM, P. O. Box P187, Bay Shore, New York 11706.

(Continued on next page)

## SPACE, ROCKETS AND ASTRONAUTS

FREE Scientific Sun-Earth-Moon Theory. Intercommunication, 4493 Felton Street, San Diego, California 92116.

**ROCKETS:** Real flying models—flights up to 2500 ft. New illustrated catalog 25¢; Singles and multistage kit, cones, engines, launchers, trackers, rocket aerial cameras, technical information. Fast service. Estes Industries, Dept. 7-D, Penrose 7, Colorado 81240.

**ROCKETS!!** Real flying models—2500 feet altitude with powerful motors. Terrific Science Projects. Tubes—Cones—Parachutes—Launchers—Igniters. Gigantic catalog—rocket data—diagrams—25¢. Fast Delivery. Centuri Rockets, Box 1988, Phoenix, Arizona 85001.

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**FIBERGLASS Canoes, Kayaks, and Duckboats.** Many exciting models. Easily assembled kits. \$39.95 up. Free Literature. Riverside Canoes, Box 5595P, Riverside, Calif. 92507.

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**CANOEES By Trailcraft, Inc.** Kits of wood and canvas or molded fiberglass. Write Box 60686, Concordia, Kansas 66901.

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(Continued from preceding page)

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**SEAHORSES,** Animals, Aquariums and Pet Supplies. Catalog 25¢. Aqualand, Box 130, Miami, Fla. 33145.

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(Continued from preceding page)

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**FREE Catalog**—Micrometers, Dial Calipers, Indicators, Unimat Lathes—Raymond Leung, Rm136, 664 King's Road, Hong Kong.

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**JEEP** And Gov't. Surplus Buying Manual (Jeeps Pictured) 50¢. Surplus Bargain Catalogue 50¢. Both \$1. Surplus Bargains, Box 789PM, York, Penna. 17405.

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**GOVERNMENT SURPLUS**. How and Where to buy in your area. Send \$1.00. Surplus Information, Headquarters Bldg., PM, Washington, D. C. 20036.

**GOVERNMENT Surplus**, Complete Sales Directory and Buying Guide \$1.00. Surplus Publications, Box 26062-M, Los Angeles, Calif. 90026.

**BIG MONEY** In Government Surplus—Details: Box 163C, San Augustine, Texas 75972.

**JEeps** From—\$52.50; Typewriters from—\$4.15; Cars from—\$31.50. Walkie-talkies, motorcycles, airplanes, boats, Typical "As Is" bid bargains from Uncle Sam. Tremendous variety. Exciting free list. Write: Enterprises, Box 402X67, Jamaica, New York 11430.

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(Continued on next page)

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(Continued from preceding page)

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(Continued from preceding page)

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## MONEYMAKING OPPORTUNITIES

(Continued from preceding page)

**BABY Shoe Bronzing Business.** Make Money. Kiktavi, PMX1, Box 93, Solana Beach, California 92075.

**FULL Or part time,** sell America's finest real estate signs. Groff, 15056, Tampa, Florida 33614.

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**MONEY MAKERS:** Groups, Individuals. Write: Boyer, Dept. PM, Yatesboro, Pennsylvania 16263.

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(Continued on next page)



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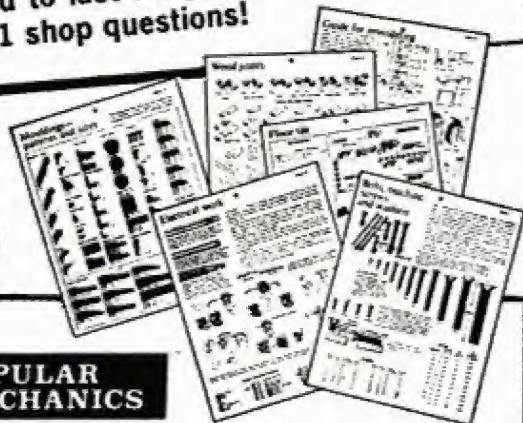
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## 8" TILT ARBOR POWER SAW

**DOES WORK OF \$75 BENCH SAW** as is. Converts easily to equal any \$300 floor model cabinet units! Crosscuts, rips, mitres, cuts compound angles, dados, makes coves and mouldings.

**\$1995** f.o.b. factory. Wt. 25 lbs. Incl. completely assembled cast iron and steel 8" saw with ground cast iron table, blade guard, less blade. **RIP FENCE**, if desired, for easier work alignment, \$3.50 add'l.

**PRECISION BALL BEARING SPINDLE** for Commercial Service, \$5.00 add'l.

**SAW BLADE TILTS... TABLE STAYS LEVEL**

Locks securely at any angle up to 50°, raises, lowers 0°-2 1/4". Patented tilt mechanism, accurate etched scale. Patented motor mount takes std. 1/4 h.p. or larger motor, keeps belt tight, assures perfect alignment at removes to take dadoe heads, cutters, etc. (not incl.). Accurate mitre gauge assembly. Ground spindle. Enclosed steel base. "Compo" bearings. Access. Std. size (for bench saw) \$3.50; larger fence (for cabinet base, as ill'd.) \$4.50.

**FREE CABINET BASE PLANS** Use as portable bench saw as received (inset photo) or transform easily and inexpensively into floor model (as shown) photo. to do work of floor models costing \$300. **FREE plans...** all you'll need are a sheet of 3/4" plywood and 3-4 hours. Use your AMCO saw for cutting. Plans provide 27" x 24" work surface, 33" height, tool storage compartment.

**10-YEAR FULL SERVICE GUARANTEE\***

## 6" SWING 3-FOOT LATHE



Optional faceplate for turning bowls, trays, lamp bases, rosettes, etc. \$2.50. **\$1495** f.o.b. factory Wt. 14 lbs.

Set of 3 high speed turning chisels, \$4.95 add'l.  
**DOES THE WORK OF \$40 UNITS...** with same precision and speed. Turns wood, plastic. Sturdy cast iron with tubular steel bed. Ball thrust cup center, spur center, T-rest assembly, lever action tail stock, 2-speed pulley. Fits any motor.

**10-YEAR FULL SERVICE GUARANTEE\***

## FULL 22" LONG, 4 1/8" JOINTER-PLANER

**\$2495**



f.o.b. factory. Wt.: 19 lbs. Complete as shown.

100% precision ground cast iron and steel.

**DOES THE WORK OF \$60 UNITS...** Professional power planing at a hand tool price. Make faster, more accurate joints, rabbetts, bevells for windows, doors, drawers, square tapered legs—Adjustable precision ground cast iron tables. Patent-pending design holds knife to table clearances at any depth. Rabbett depth 3/8". Fence adjustable 0°-50°. Hardened, ground hi-speed steel knives. Dual cutter guards. Balanced cutter head.

**10-YEAR FULL SERVICE GUARANTEE\***

## PRECISION 4" x 36" BELT SANDER

f.o.b. factory. Wt. 15 lbs.



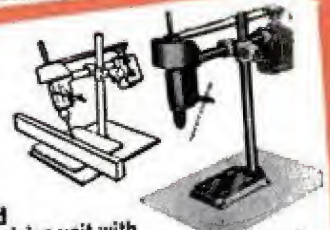
**\$1495** Disc Sander attachment incl. disc bracket, ground cast table (tilts 0-45°): \$7.95 add'l.

**DOES WORK OF \$50 SANDERS...** The world's most talented belt sander. Heavy cast sander incl. 4" x 36" sanding belt, V-pulley drive, multi-purpose drive spindle. Changes from horizontal to vertical sanding in secs. Uses 1/2 hp or larger motor.

**10-YEAR FULL SERVICE GUARANTEE\***

## 32" RADIAL DRILL PRESS

All cast iron and steel f.o.b. factory Wt. 30 lbs. 1/2" cap. **\$3495** Jacob's chuck incl.



**DOES WORK OF \$90 UNITS...** and much more. Industrial quality precision unit with all standard features, many extras. Head raises, lowers. Depth of throat up to 16". Pre-set to any angle for on-or-off table drilling, even horizontal drilling. **10-YEAR FULL SERVICE GUARANTEE.\***

**BRAND NEW MOTOR**

DEVELOPING FULL 1 HP... **\$1990** f.o.b. FACTORY

FOR ANY OF ABOVE MACHINES, WT. 17 LBS. PURCHASED SEPARATELY, \$24.85

# Get the **inside story**



## on quiet economy

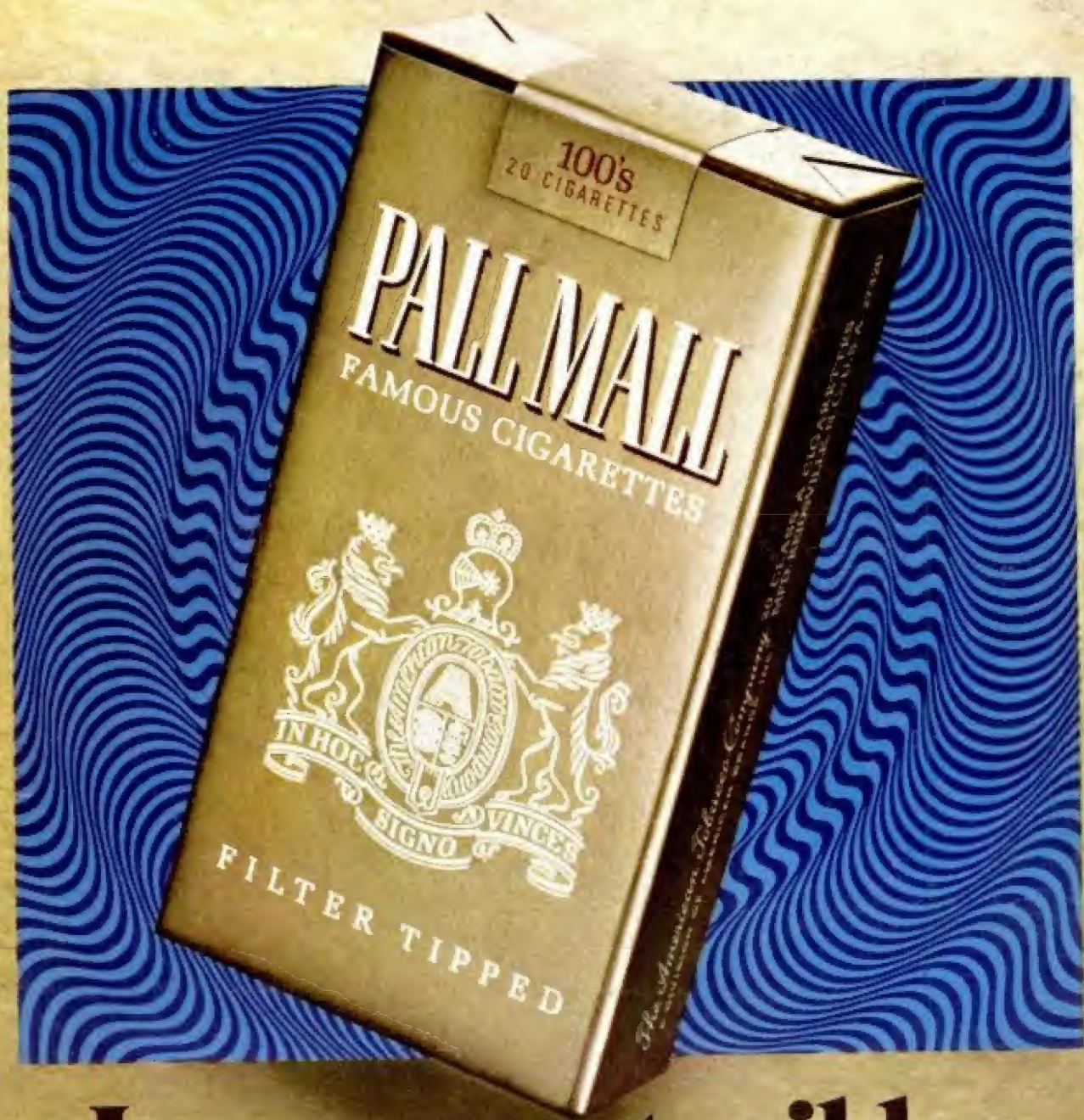
More miles per gallon. More quiet miles per hour. That's the Inside Story on MerCruiser and Jet-Prop exhaust. Engine exhaust and sound are discharged through the propeller hub. Buried and left behind, deep under water. Less drag. Freer breathing for the engine. Jet-Prop exhaust—just one of dozens of reasons MerCruiser powers more boats than any other stern drive. Look at this one feature, and then look at the exhaust snouts of other drives. Look—and compare—Power Trim, Thunderbolt ignition and other MerCruiser features with conventional drives. Talk to your dealer. Stop, look and listen. The Inside Story of MerCruiser will be the best thing that ever happened to you in stern drives.

**MERC**CRUISER  
STERN DRIVES



For the name of your nearest MerCruiser dealer, see the Yellow Pages under "Outboard Motors."  
Kiekhaefer Mercury, Division of Brunswick Corp., Fond du Lac, Wisconsin; Canada, Ltd.; Australia Pty. Ltd.

# PALL MALL GOLD 100's



## Longer... yet milder

longer length - milder taste.

You get both with

## PALL MALL GOLD 100's

20 mg. "tar," 1.4 mg. nicotine  
av. per cigarette, FTC Report NOV. 70